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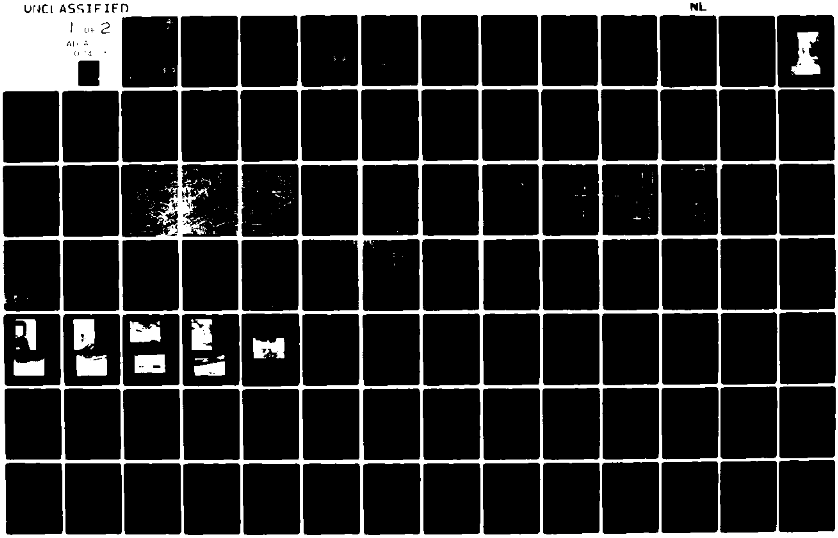

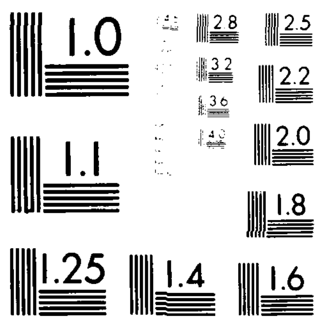


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LEVEL II

# LONG ISLAND BASIN

# MAMARONECK RESERVOIR DAM

## WESTCHESTER COUNTY, NEW YORK
## INVENTORY NO. N.Y. 111

# PHASE I INSPECTION REPORT
# NATIONAL DAM SAFETY PROGRAM



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NEW YORK DISTRICT CORPS OF ENGINEERS

JULY 1981

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Mamaroneck Reservoir Dam
Westchester County
Long Island Basin

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)


This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

The examination of documents and the visual inspection findings of the dam and its appurtenant structures did not reveal conditions which constitute an immediate hazard to


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human life and property. However, the dam has some deficiencies which require further investigations and remedial action.

Using the Corps of Engineers' screening criteria for initial review of the adequacy of the overflow section (spillway), it has been determined that the spillway structure is inadequte for all floods in excess of 23 percent of the Probable Maximum Flood (PMF). Overtopping of the dam could cause breaching of the embankment section of the dam: this would significantly increase the hazard to loss of life and property. The overflow section is therefore judged to be "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a "seriously inadequate" spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be an inadequacy in the spillway capacity, such that if a severe storm were to occur, overtopping would significantly increase the hazard to life downstream of the dam.

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LONG ISLAND BASIN

# MAMARONECK RESERVOIR DAM

WESTCHESTER COUNTY, NEW YORK
INVENTORY NO. N.Y. 111

# PHASE I INSPECTION REPORT
# NATIONAL DAM SAFETY PROGRAM

NEW YORK DISTRICT CORPS OF ENGINEERS

JULY 1981

## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D. C., 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
MAMARONECK RESERVOIR DAM
I.D. NO. N.Y. 111
LONG ISLAND BASIN
WESTCHESTER COUNTY, N.Y.

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APPENDICES

PHASE I INSPECTION REBORT
NATIONAL DAM SAFETY PROGRAM

| | |
|---|---|
| NAME OF DAM: | Mamaroneck Reservoir (N.Y. 111) |
| STATE LOCATED: | New York |
| COUNTY LOCATED: | Westchester |
| STREAM: | Mamaroneck River |
| BASIN: | Long Island |
| DATE OF INSPECTION: | 02 April 1981 |

ASSESSMENT

The examination of documents and the visual inspection findings of the dam and its appurtenant structures did not reveal conditions which constitute an immediate hazard to human life and property. However, the dam has some deficiencies which require further investigations and remedial action.

Using the Corps of Engineers' screening criteria for initial review of the adequacy of the overflow section (spillway), it has been determined that the spillway structure is inadequte for all floods in excess of 23 percent of the Probable Maximum Flood (PMF). Overtopping of the dam could cause breaching of the embankment section of the dam: this would significantly increase the hazard to loss of life and property. The overflow section is therefore judged to be "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a "seriously inadequate" spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be an inadequacy in the spillway capacity, such that if a severe storm were to occur, overtopping would significantly increase the hazard to life downstream of the dam.

It is therefore recommended that within 3 months from the date of notification to the owner, detailed hydrological/ hydraulic investigations of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed. Analyses should include investigations to obtain more information regarding the upstream and downstream

control facilities and their affect upon the overtopping potential and stability of the dam. In addition, it has been found on the basis of screening analyses of stability, that the overflow section of the dam is inadequate for overturning and sliding under extreme flooding conditions equal to ½ PMF and PMF. Further analysis of the structural stability of the spillway should be performed at the same time.

Within 18 months of the date of notification to the owner, modifications to the structure, deemed necessary as a result of studies, should have been completed. A detailed emergency operation plan and warning system should be promptly developed in the interim. Also, around-the-clock surveillance should be provided during periods of unusually heavy precipiation.

The dam has a number of additional problem areas which, if left uncorrected, have the potential for the development of hazardous conditions and must be corrected within 12 months.

1. Monitor periodically the leakage at the left abutment. Document this information for future reference.

2. Repair the concrete slab on the crest of the embankment.

3. A program of periodic inspection and maintenance of the dam and appurtenances, including yearly operation and lubrication of all gates should be established. This information should be documented for future reference. An emergency action plan should be developed and maintained and updated periodically during the life of the structure.

Eugene O'Brien

Eugene O'Brien, P.E.
New York No. 29823

Approved By:

Col. W.M. Smith, Jr.
New York District Engineer

05 AUG 1981

Date:

OVERVIEW

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
MAMARONECK RESERVOIR DAM
I.D. NO. N.Y. 111
MAMARONECK RIVER BASIN
WESTCHESTER COUNTY, N.Y.

## SECTION 1 - PROJECT INFORMATION

### 1.1 GENERAL

a. Authority

The Phase I inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers Contract No. DACW 51-81-C-0008 in a letter dated 14 December 1980 in fulfillment of the requirements of the National Dam Inspection Act, Public Law 92-367 dated 8 August 1972.

b. Purpose of Inspection

This inspection was conducted to evaluate the existing condition of the dam, to identify deficiencies and hazardous conditions, to determine if these deficiencies constitute hazards to life and property, and to recommend remedial measures where required.

### 1.2 DESCRIPTION OF PROJECT

a. Description of the Dam and Appurtenant Structures

Mamaroneck Reservoir Dam consists of a concrete buttress section (Ambursen type) and an earth embankment section. The length of each section is 130 feet and 55 feet, respectively. The crest of the buttress section is at El 40 (MSL); the crest elevation of the embankment is 4 feet higher, at El 44.

According to the available drawings, the embankment contains a concrete corewall at its downstream crest edge. The wall is approximately 1 foot thick and extends the full length of the embankment. The upstream slope is approximately 1V:2H (vertical to horizontal) and is protected with small stones and boulders. The downstream slope is gently sloping from the embankment crest to the downstream waterwork facilities. The crest of the embankment is covered by a 7 foot wide concrete slab.

The concrete buttress section acts as an ogee-type spillway. The buttresses are constructed of reinforced concrete and are spaced 15 feet on center. Water bearing reinforced concrete slabs form the upstream and downstream surfaces. The upstream slabs are supported at its inner surface by reinforced concrete haunches at each buttress and by a continuous concrete footing at the upstream base of the dam.

Two uncontrolled reinforced concrete box water conduits (3 foot high by 6 foot wide) are located between adjacent buttress sections at the approximate center of the dam. The box conduits are at invert El 33 and extend the full width of the dam. Bar-screens are located at the upstream end of each conduit.

A 24-inch steel or cast iron pipe serves as a reservoir drain for the project. The pipe is regulated by a 24-inch gate valve which is located within the buttress dam. Access to the operating facilities is via a concrete chamber located at the crest of the embankment section.

The spillway discharge channel is primarily a rock and earth channel of varying width and depth.

At the crest of the embankment dam is a gatehouse structure which has been used to regulate flow to the downstream water treatment facilities. Neither the regulating facilities nor the treatment facilities are operated since the reservoir is no longer used for water supply.

b. Location

The dam is located in Mamaroneck, Westchester County, New York. The dam is located adjacent to Mamaroneck Avenue approximately 1 mile south of the Hutchinson Parkway-Mamaroneck Avenue intersection.

c. Size Classification

The dam has a structural height of 19 feet and a reservoir storage capacity of 107 acre-feet. The dam is considered small in size (50 to 1,000 acre-feet).

d. Hazard Classification

The dam is classified as "high" hazard due to the number of homes located 1000 feet downstream of the dam.

e. Ownership

The dam is owned by the Westchester Joint Waterworks, 1625 Mamaroneck Ave., Mamaroneck, New York, 10543, Telephone No. (914) 698-3500. The person to contact is Mr. Joe Morgan, Engineer. The dam is maintained by the Village of Mamaroneck, 169 Mt.Pleasant Avenue, Mamaroneck, New York, 10543, Telephone No. (914) 698-0052. The person to contact is Mr. Frank Feed, Village Engineer.

f. Purpose

Prior to the mid-1970's the impoundment created by the dam was used for water supply. The dam presently serves as a flood control structure.

g. Design and Construction History

The dam was designed by Mr. Alexander Potter, 50 Church Street, New York, New York, circa 1930. The constructor of the dam is unknown. The original contract drawings show a

sluice gate structure at the left abutment; this structure has not been constructed. Modifications have been performed at the right abutment, adjacent to Mamaroneck Avenue, since the original construction drawings do not show the present elevated roadway. It is uncertain as to when these changes had been made. In 1978 the two water conduits at the approximate center of the buttress dam were constructed. These structures were designed by Hazen and Sawyer Engineers, 360 Lexington Avenue, New York, New York, 10017.

h. Normal Operating Procedures

Discharge is uncontrolled through the two water passage conduits. It is uncertain as to the normal operating procedure of the reservoir drain.

## 1.3 PERTINENT DATA

| | |
|---|---|
| a. Drainage Area, Square Miles | 15.24 |
| b. Discharge at Damsite, cfs | |
| Maximum Known Flood at Damsite | Unknown |
| Overflow Section (Maximum Pool - Top of Earth Embankment) | 4240 cfs |
| Reservoir Drain: Maximum Pool | Unknown |
| Water Conduits: Maximum Pool (Combined) | 560 cfs |
| c. Elevation, USGS Datum, MSL | |
| Top of Overflow Section (Normal Pool) | 40 feet |
| Top of Earth Embankment (Maximum Pool) | 44 feet |
| Top of Flashboards | 42.5 feet |
| Conduit Invert | 33 feet |
| d. Reservoir | |
| Length of Maximum Pool | 500 feet* |
| Length of Normal Pool | 500 feet* |
| e. Storage | |
| Maximum Pool | 320 acre-feet |
| Normal Pool | 107 acre-feet |
| f. Reservoir Surface | |
| Maximum Pool | 49 acres |
| Normal Pool | 33.5 acres |

* 500 feet is the fetch, as measured perpendicular from the dam to Mamaroneck Avenue

g. <u>Embankment Dam</u>

| | |
|---|---|
| Type | Earthfill with Concrete Core Wall |
| Length | 55 feet |
| Height | 15 feet |
| Concrete Apron Width at Crest | 7 feet |
| Side Slopes: Upstream (V:H) | 1:2 |
| Downstream (V:H) | Unknown |

h. <u>Overflow Section</u>

| | |
|---|---|
| Type | Concrete Buttress (Ambursen) |
| Height | 19 feet |
| Upstream Slab (Slope) | Concrete (1V:2H) |
| Downstream Slab (Slope) | Concrete (1H:1V) |
| Buttress Width | 1 foot |

i. <u>Reservoir Drain</u>

| | |
|---|---|
| Type | Concrete |
| Diameter | 24-inch |
| Closure | Gate Valve |

## SECTION 2 - ENGINEERING DATA

### 2.1 GEOLOGY

Mamaroneck Reservoir Dam is located in the New England Upland Section of the New England Maritime Physiographic Province[6]. The bedrock in this Section consists of metamorphic, igneous and sedimentary rocks which have undergone a complex sequence of deposition, folding, faulting and erosion. In the vicinity of the damsite, the rock is gniess of Precambrian Age[7]. The rock at the damsite has discontinuities which appear to run both parallel and perpendicular to the dam. The local relief is that of a maturely dissected peneplain modified by continental glaciation.

### 2.2 SUBSURFACE INVESTIGATIONS

The only subsurface investigation which exists at the immediate damsite is a longitudinal ground surface profile. This profile is shown in Appendix A.

The soil deposits in the vicinity of the damsite are primarily glacial tills deposited during the Late Pleistocene Age. The till is composed primarily of gravels, sands and silts.

### 2.3 DESIGN RECORDS

The original construction drawings and the modification drawings which exist for the project are shown in Appendix A.

### 2.4 CONSTRUCTION RECORDS

The original construction records are not available for the project. Construction records, however, for the construction of the water passage conduits are kept at the Westchester Joint Waterworks, 1625 Mamaroneck Avenue, Mamaroneck, New York, 10543, Tel. No. (914) 698-3500.

### 2.5 OPERATION RECORDS

Operation records exist for the project and are available at the Westchester Joint Waterworks, 1625 Mamaroneck Avenue, Mamaroneck, New York, 10543.

### 2.6 EVALUATION OF DATA

The information obtained from the available documents and a visual inspection was considered adequate for the Phase I inspection and evaluations.

## SECTION 3 - VISUAL INSPECTION

### 3.1 FINDINGS

a. General

A visual inspection of Mamaroneck Reservoir Dam was made on 2 April 1981. The weather was sunny and clear and the temperature was $60^{\circ}F$. At the time of the inspection, the reservoir level was a few inches above the water conduit invert.

b. Embankment and Buttress Dam

The overall condition of the embankment dam appears good. The concrete slab on the crest of the dam is deteriorated at the location of the concrete core wall (See PHOTOGRAPH 1). The vertical and horizontal alignments of the crest is good.

The upstream slope of the dam appears to be in good condition. A gravel access road exists along the slope (See PHOTOGRAPH 2); this road was constructed during construction of the water passage conduits. The existing downstream slope is gently sloping and differs from the slope shown on the drawings. The dimension of this slope was probably modified during reconstruction of the adjacent Mamaroneck Avenue.

The gatehouse and regulating facilities, which are no longer operational since the project is no longer used for water supply purposes, appear to be in fair condition (See PHOTOGRAPH 3).

The overall condition of the buttress dam is good. The upstream and downstream outer surfaces of the reinforced concrete slabs appear to be in good condition (See PHOTOGRAPHS 4 and 5). The inner concrete surface of the slabs, the upstream concrete haunches, and the concrete buttresses were also in good condition. Little to no deterioration and/or spalling exist along the horizontal or vertical construction joints (See PHOTOGRAPHS 4 and 5). The flashboards and metal supporting rods are also in good condition (See PHOTOGRAPH 6).

The concrete surfaces of the water passage conduits are in good condition (See PHOTOGRAPH 6). The bar-screens which exist at the upstream side are also in good condition, and clear of debris (See PHOTOGRAPH 5).

The overflow section sidewalls appear to be in good condition (See PHOTOGRAPHS 4 and 7). The rock which forms the sides of the upstream channel at the left abutment also appears to be intact, with no signs of erosion and/or deterioration (See PHOTOGRAPH 5).

No emergency action plan exists for the project.

c. Appurtenant Structures

The concrete which encases the 24-inch reservoir drain, both within the buttress dam and downstream of the dam (See PHOTOGRAPH 4), appears to be in good condition.

At the time of this inspection, there was flow through the drain. The gate valve which regulates this flow could not be operated. The valve is poorly maintained, as evidenced by the rusted surfaces and lack of lubrication.

d. Downstream Channel

The downstream channel is the Mamaroneck River (See OVERVIEW). In the immediate vicinity of the dam, the channel floor and side slopes are rock. There exists some large trees and shrubs in the channel; however, these will not impede flow over the dam.

Approximately 800 feet downstream of the dam is a concrete retaining wall which forms the left channel sidewall; it is uncertain as to the origin of this wall.

e. Reservoir Area

In the vicinity upstream of the dam, there was no evidence of sloughing, potentially unstable slopes or other unusual conditions which would adversely affect the dam. There appears to be no sedimentation problems in the reservoir.

f. Abutments

Seepage was observed immediately downstream of the left abutment contact (See PHOTOGRAPH 7). The flow was small and was emerging from the discontinuities in the rock.

## 3.2 EVALUATION OF OBSERVATIONS

Visual observations made during the course of the inspection did not indicate any serious problems which would adversely affect the adequacy of the dam and appurtenant facilities at the present time. The following is a summary of the problem areas encountered, in order of importance, with the appropriate recommended action:

1. Monitor regularly the leakage at the left abutment with the aid of weirs or other measuring devices. Document this information for future reference.

2. Repair the concrete slab at the crest of the embankment.

3. Provide a program of periodic inspection and maintenance of the dam and appurtenances including yearly operation and maintenance of the reservoir drain and its control facilities. Document this information for future reference. Also develop an emergency action plan.

## SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

### 4.1 PROCEDURES

No written operation and maintenance procedures exist for the project. The normal operation is to allow flow through the water conduit passage.

### 4.2 MAINTENANCE OF DAM

It is reported that maintenance of the dam is performed on a regular basis by the Village of Mamaroneck, 169 Mt. Pleasant Avenue, Mamaroneck, New York, 10543.

### 4.3 WARNING SYSTEM IN EFFECT

No warning system is in effect or in preparation.

### 4.4 EVALUATION

The overall condition of the dam and appurtenant structures appears to be good. Recommendations in connection with regular maintenance are discussed in Section 7.

## SECTION 5 - HYDROLOGIC/HYDRAULIC

### 5.1 DRAINAGE AREA CHARACTERISTICS

The Mamaroneck Reservir Dam is located on the Mamaroneck River in Westchester County, State of New York (Hydrologic Unit Code No. 02030102) just upstream of Interchange 10 on the New England Thruway. The drainage area contributing to the reservoir is 15.24 square miles and rises from a lake elevation of 33.0 to over 500 feet just south of Kensico Reservoir. The basin is about 40 percent urban-suburban and 60 percent woods or brushwood, with some storage in the form of lakes and wooded marsh.

The Mamaroneck River flows in a southerly direction for about 7 miles to the Hutchinson River Parkway and its junction with its tributary, the West Branch Mamaroneck and the upstream end of the reservoir.

### 5.2 ANALYSIS CRITERIA

The analysis of the spillway adequacy was performed using the Corps of Engineers HEC-1DB computer program(1). The basin was divided into seven (7) sub-basins and Synder unit hydrograph coefficients for each obtained from a previous study(2) (See Appendix D). The all season Probable Maximum Precipitation (PMF) of 22.5 inches (for Zone 6) was taken from Hydrometeorological Report No. 33(3). In accordance with the "Recommended Guidelines for Safety Inspection of Dams"(4), the adequacy of the spillway was analyzed using the Probable Maximum Flood (PMF).

### 5.3 SPILLWAY CAPACITY

The Mamaroneck Dam was constructed as a "run of River" dam and the entire dam length is an overflow section with a crest elevation of 40 feet (MSL). Two uncontrolled outlets were subsequently constructed at an elevation of 33 feet. These openings are 6.3 feet x 3.0 feet and have a computed discharge of 560 cfs with a head of 9.5 feet (water surface at top of embankment dam). The discharge over the overflow section with water surface at 44.0 feet (MSL) is 4,240 cfs.

### 5.4 RESERVOIR CAPACITY

The normal storage capacity of the reservoir is listed as 107 acre-feet. The surcharge storage between spillway crest elevation (40 feet) and the top of the embankment (44 feet) is 213 acre-feet, which is equivalent to about 0.3 inches of runoff over the entire drainage basin.

## 5.5 FLOODS OF RECORD

No records of maximum lake elevations nor discharges are available, however, the Mamaroneck River is gauged, and the station records indicate a peak discharge at the gauge (drainage area 23.4 square miles) of 3,700 cfs on September 26, 1975 (Guage #01301000-Ref. No. 5).

## 5.6 OVERTOPPING POTENTIAL

The potential of the dam being overtopped was investigated on the basis of the spillway discharge capacity and the available surcharge storage to meet the selected design flood inflows.

The computed PMF, with a peak inflow of 21,460 cfs (1,390 cfs/square mile), routed through the reservoir resulted in a maximum water surface elevation of 58.35 feet (MSL), 18.35 feet above the crest of the dam. The corresponding peak outflow was 21,390 cfs. One-half (1/2) PMF resulted in a peak elevation of 50.91 and a peal outflow of 10,680 cfs. The dam will discharge 22.6 percent of the PMF without overtopping its abutments.

The results of a multi-plan HEC-1DB analysis are listed below.

| RATIO OF PMF | PEAK INFLOW cfs | PEAK OUTFLOW cfs | OVERTOPPING IN FEET |
|---|---|---|---|
| 1.00 | 21462 | 21392 | 14.35 |
| 0.75 | 16097 | 16035 | 10.75 |
| 0.50 | 10731 | 10680 | 6.91 |
| 0.25 | 5366 | 5330 | 2.68 |

## 5.7 EVALUATION

The Mamaroneck Reservoir Dam, a run of the river dam, is designed to be overtopped; however, 13 hours of flow over the abutments may cause serious damage to the embankment dam. The overtopping could cause failure of the embankment, thus significantly increasing the hazard for the loss of life downstream. The spillway is therefore assessed as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

## SECTION 6 - STRUCTURAL STABILITY

### 6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Visual observations did not indicate conditions which would adversely effect the structural stability of the dam. The observed seepage at the left abutment is not considered detrimental to the dam's stability or safety at the present time.

b. Design and Construction Data

The original design computations regarding the structural stability of the embankment or the concrete buttress are not available.

c. Operating Records

There are no available records of reservoir elevation and gate operation. No major operational problems which would affect the stability of the dam were reported.

d. Post-Construction Changes

Two water conduit passages were constructed at the approximate center of the buttress dam in 1978. The details of this modification are shown on the drawings in Appendix A. No other post-construction changes have been reported.

e. Seismic Stability

According to the recommended Corps guidelines, the dam is located in Seismic Zone 1, therefore, no seismic stability analysis was performed.

### 6.2 STRUCTURAL STABILITY ANALSIS

A structural stability analysis on what was determined from the drawings to be the maximum typical section was performed. In addition the analysis was performed in accordance with recommended Corps of Engineers guidelines. The following tables list each of the cases analyzed and the results of the analyses (Ref. 4).

| Case | Description of Loading Conditions |
|---|---|
| I | Normal Loading (Top of Flashboards), Lake Level at El 42.5, no Tailwater, Full Uplift |
| II | Normal Loading, Lake Level at El 40. with 1.24 K/LF , Ice Load, Full Uplift |
| III | Unusual Loading, ½ PMF, Lake Level at El 50.91, Tailwater 12.5 Feet, no Flashboards |

| Case | Description of Loading Conditions |
| --- | --- |
| IV | Extreme Loading, Full PMF, Lake Level at El 50.91, Tailwater 15 Feet, no Flashboards. |

| Case | Location of Resultant | Friction Factor of Safety |
| --- | --- | --- |
| I | Inside Middle Third | 3.8 |
| II | Inside Middle Third | 3.1 |
| III | Inside Middle Third | 2.9 |
| IV | Inside Middle Third | 1.9 |

The results of the analyses indicate that the stability of the section analyzed is adequate in overturning for all the loading conditions considered and inadequate in sliding under the half (½) PMF and PMF events.

## SECTION 7 - ASSESSMENT/RECOMMENDATIONS

### 7.1 ASSESSMENT

a. Safety

Examination of the available documents and a visual inspection of the dam and the appurtenant structures did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial action.

Using the Corps of Engineers' screening criteria for review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 5.9 percent of the Probable Maximum Flood (PMF). The overtopping of the dam could result in a failure of the embankment and abutments thus increasing the hazard to loss of life downstream. The spillway is, therefore, adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a "seriously inadequate" spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, signficiantly increasing the hazard to loss of life downstream from the dam.

The structure stability analyses based on available information and visual inspection indicates that the stability against overturning for the buttress dam is adequate for all cases of loading considered and inadequate in sliding for the ½ PMF and full PMF events.

b. Adequacy of Information

The information and data available were adequate for performance of this investigation.

c. Need for Additional Investigations

A detailed hydrological/hydraulic investigations of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed. Analyses should include investigations to obtain more information regarding the upstream and downstream control facilities and their affect upon the overtopping potential and stability of the dam. In addition, it has been found on the basis of screening analyses of stability, that the overflow section of the dam does not meet current criteria under flooding conditions equal to half (½) PMF and PMF. Further analysis of the structural stability of the spillway should be performed at the same time to improve the stability of the dam from the one-half (½) PMF and PMF events.

d. Urgency

The additional hydrologic/hydraulic investigations and the structural stability investigations which are required must be initiated within 3 months from the date of notification. Within 18 months of notification, remedial measures as a result of these investigations must be initiated, with completion of these measures during the following year. In the interim, develop an emergency action plan for the notification of downstream residents and proper around-the-clock surveillance of the dam during periods of extreme runoff. The other problem areas listed below must be corrected within one year from notification.

## 7.2 RECOMMENDED MEASURES

1. The results of the aforementioned investigations will determine the appropriate remedial measures required.

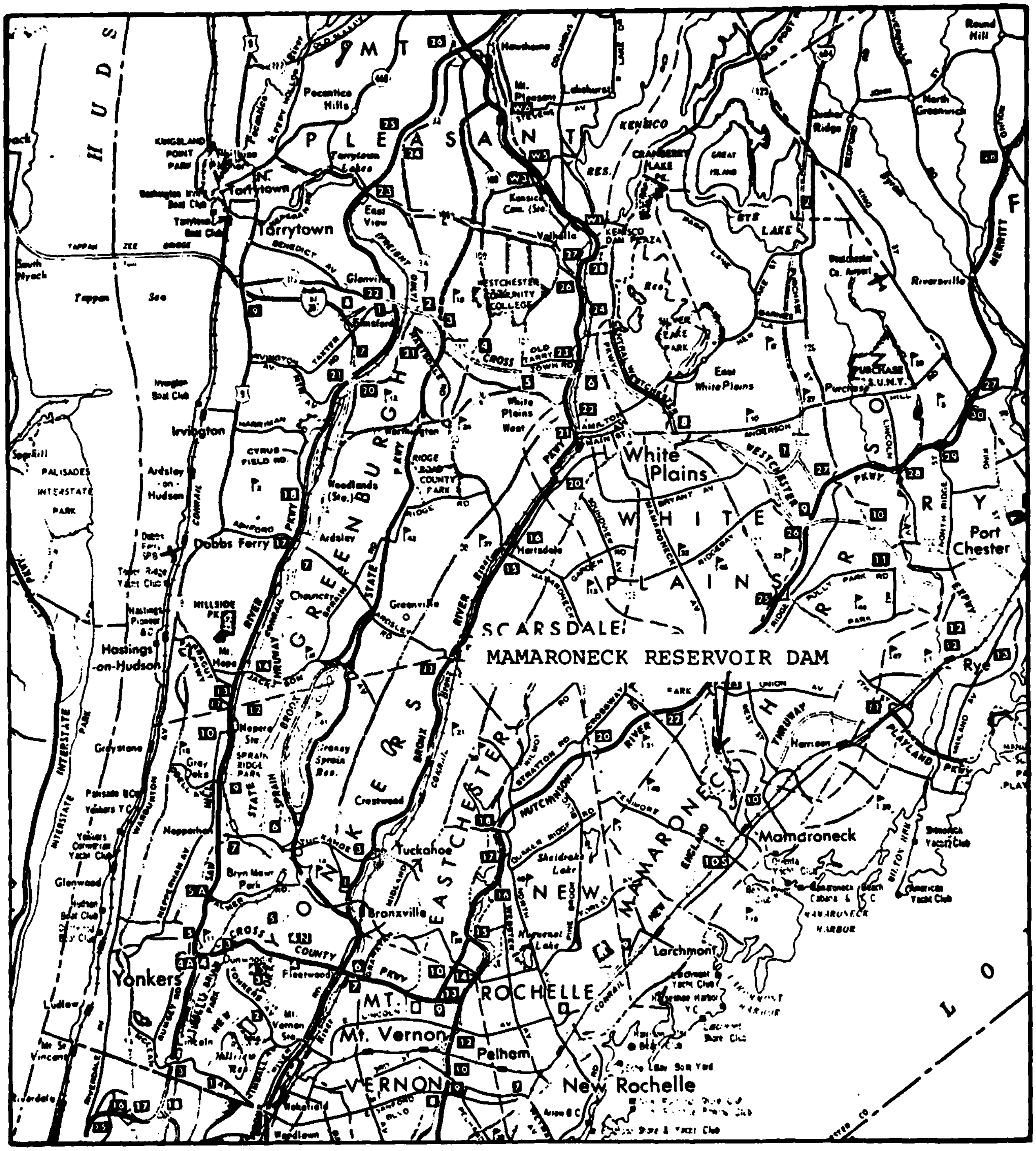
2. Monitor the leakage regularly at the left abutment. Document this information for future reference.

3. Repair the concrete apron at the crest of the embankment.

4. Provide a program of periodic inspection and maintenance of the dam and appurtenance including yearly operation and lubrication of the reservoir drain and its control facilities. Document this information for future reference. Establish an emergency action plan and maintain and update it periodically during the life of the structure.

DRAWINGS

APPENDIX A




LOCATION MAP

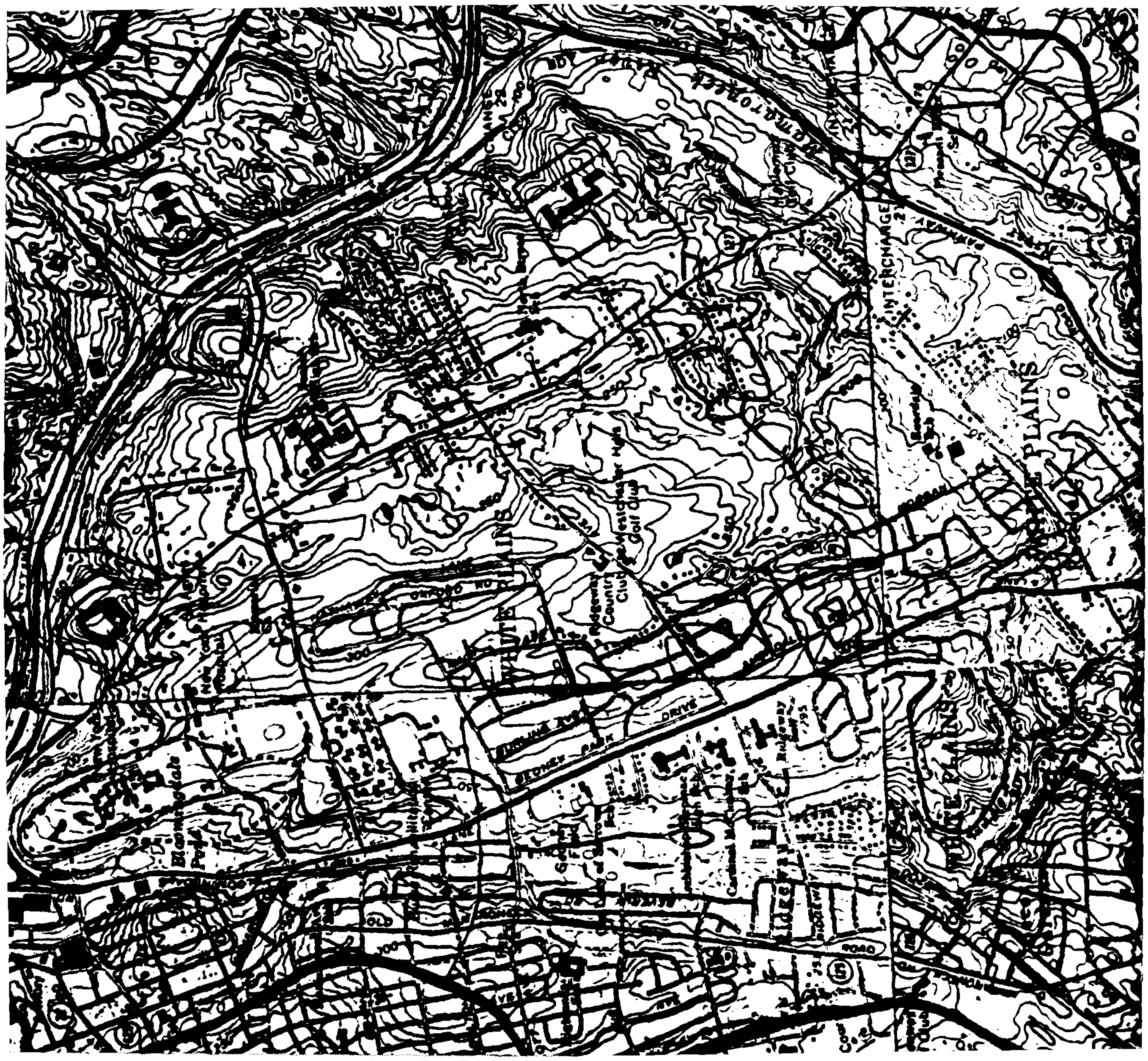
Mamaroneck Reservoir Dam

Plate 1

SCALE

0 1 2 3 4 Miles

RYE LAKE
Parks Cove
Wetzler Cove
Waterworks
COUNTY AIRPORT
CONNECTICUT
NEW YORK
Kensico Dam
Silver Lake
No 2
DRAINAGE
BASIN
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET



INTERCHANGE
PLAINS
DRIVE
ROAD

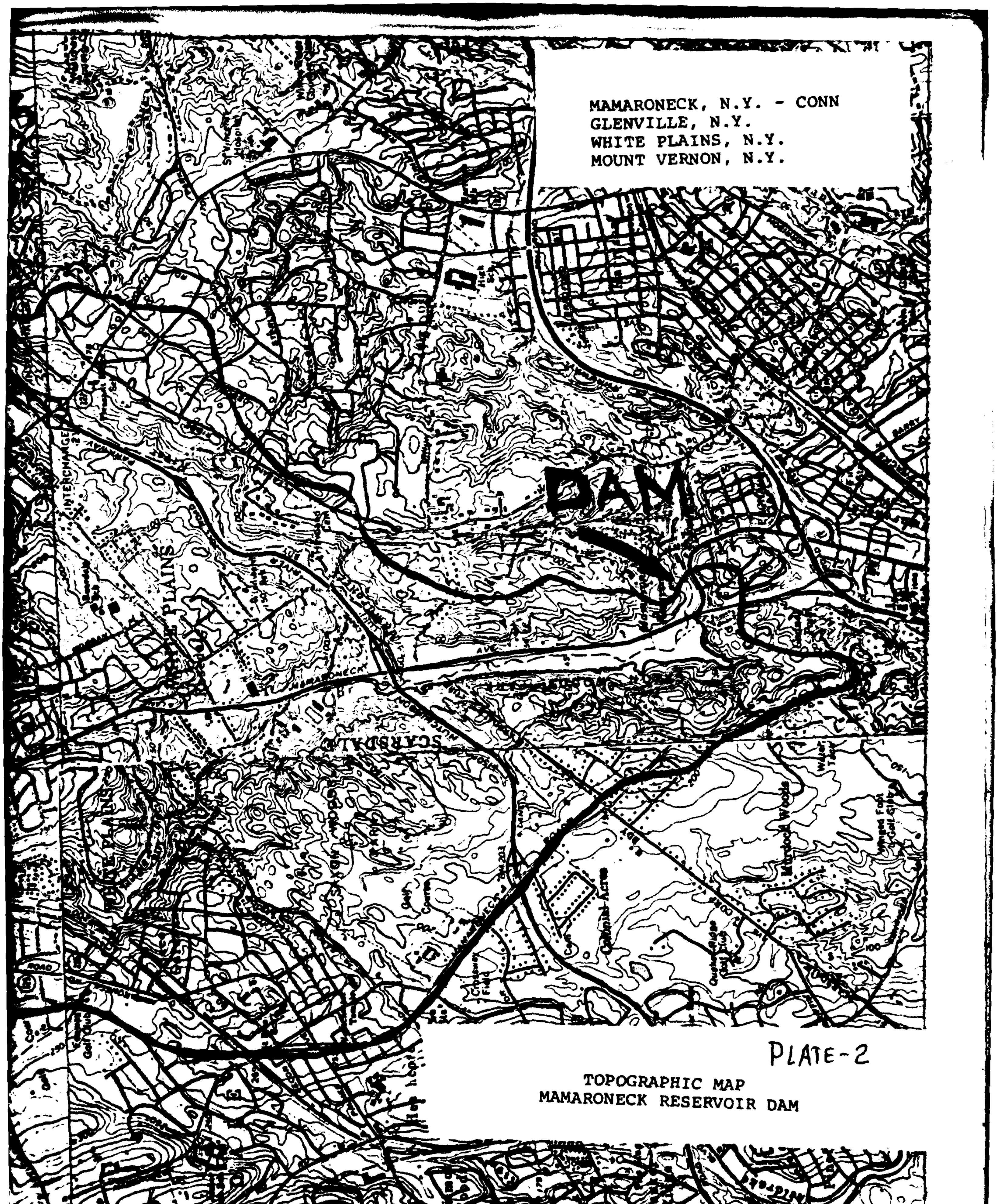
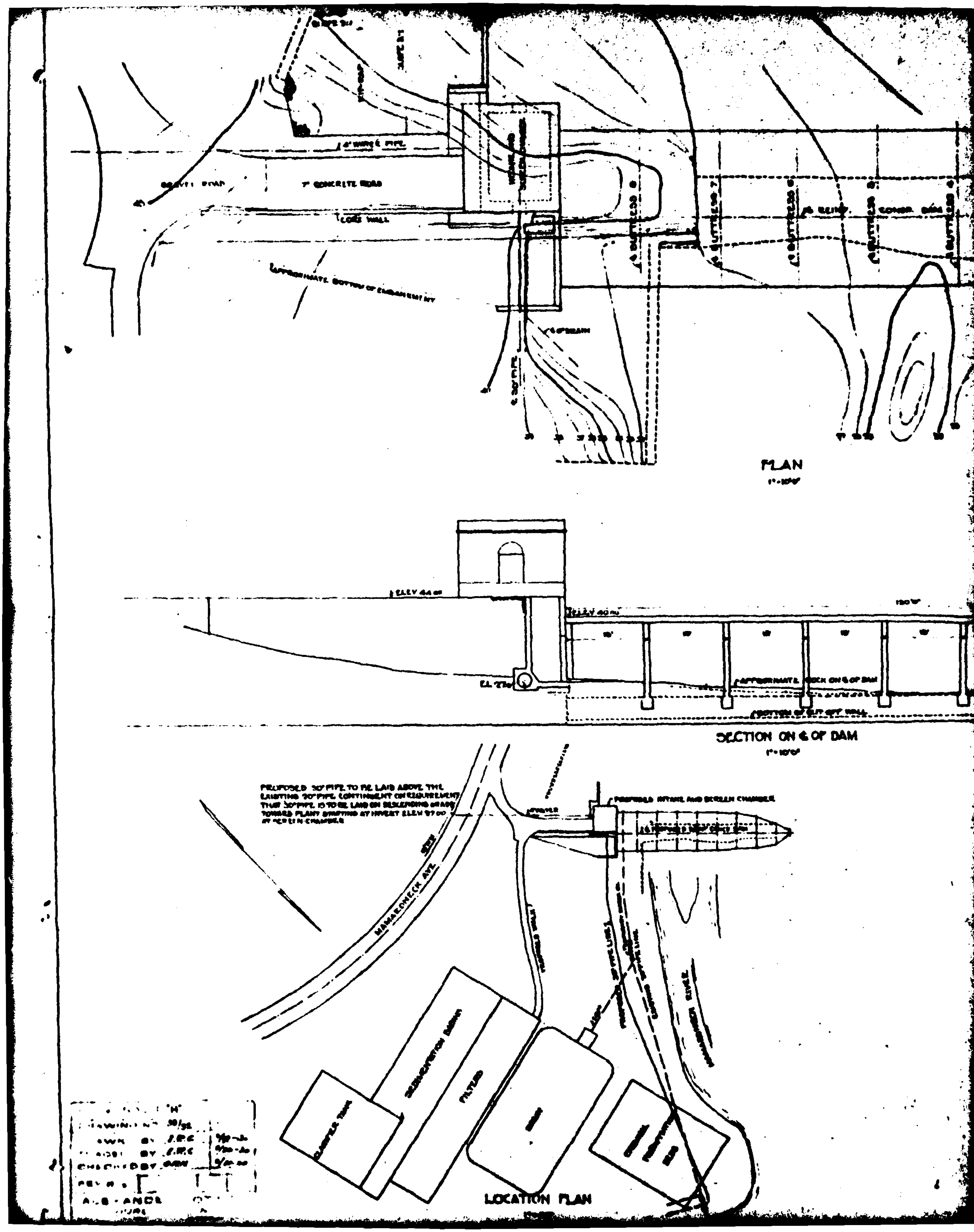
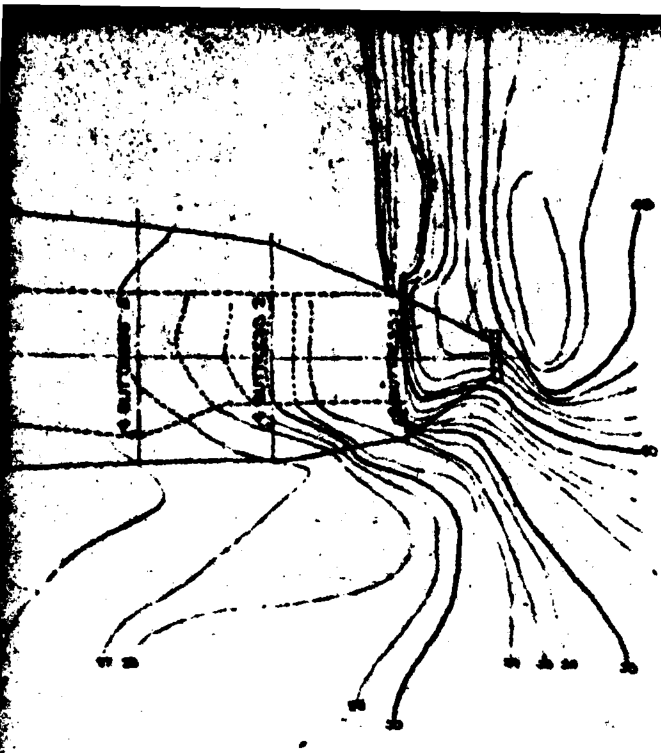


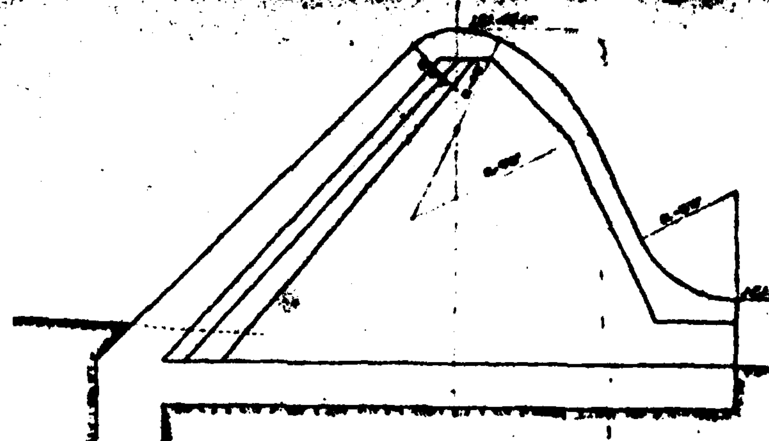

PLATE-2

TOPOGRAPHIC MAP
MAMARONECK RESERVOIR DAM

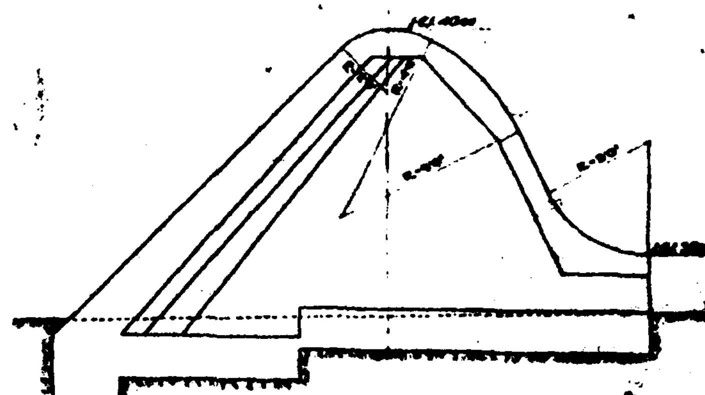


GRAVEL ROAD
7" CONCRETE ROAD
CORE WALL
APPROXIMATE BOTTOM OF EMBANKMENT
PLAN
SECTION ON ℄ OF DAM
APPROXIMATE ROCK ON ℄ OF DAM
BOTTOM OF CUT OFF WALL
PROPOSED INTAKE AND SCREEN CHAMBER
MAMARONECK AVE.
MAMARONECK RIVER
SEDIMENTATION BASINS
FILTERS
CLARIFIER TANK
LOCATION PLAN

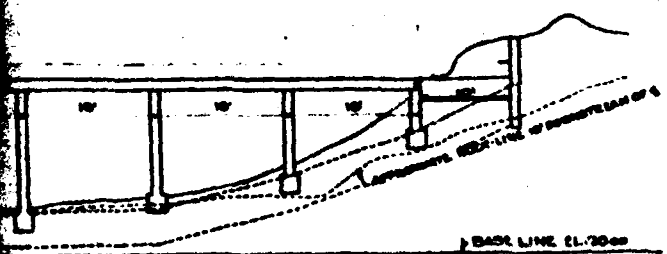




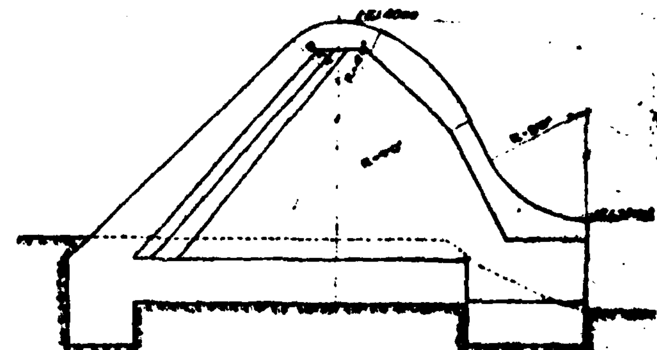
BUTTRESS 4,5,6,7,8.



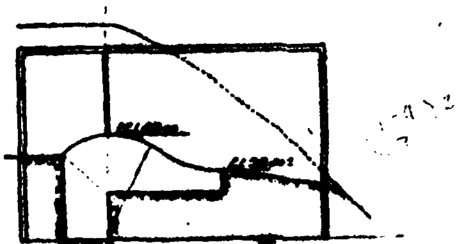
BUTTRESS 3.



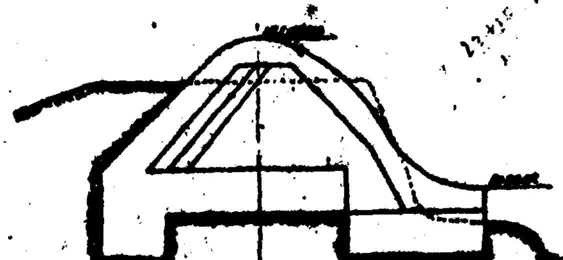




BUTTRESS 2.



NORTH ABUTMENT



BUTTRESS I

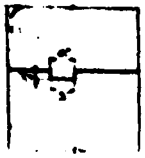
WESTCHESTER JOINT WATER WORKS No 1

PLANS AND SECTIONS

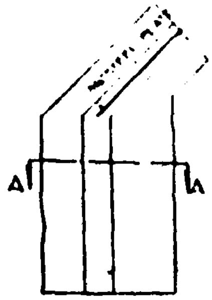
DAM AT FILTER PLANT.

LOCATION III

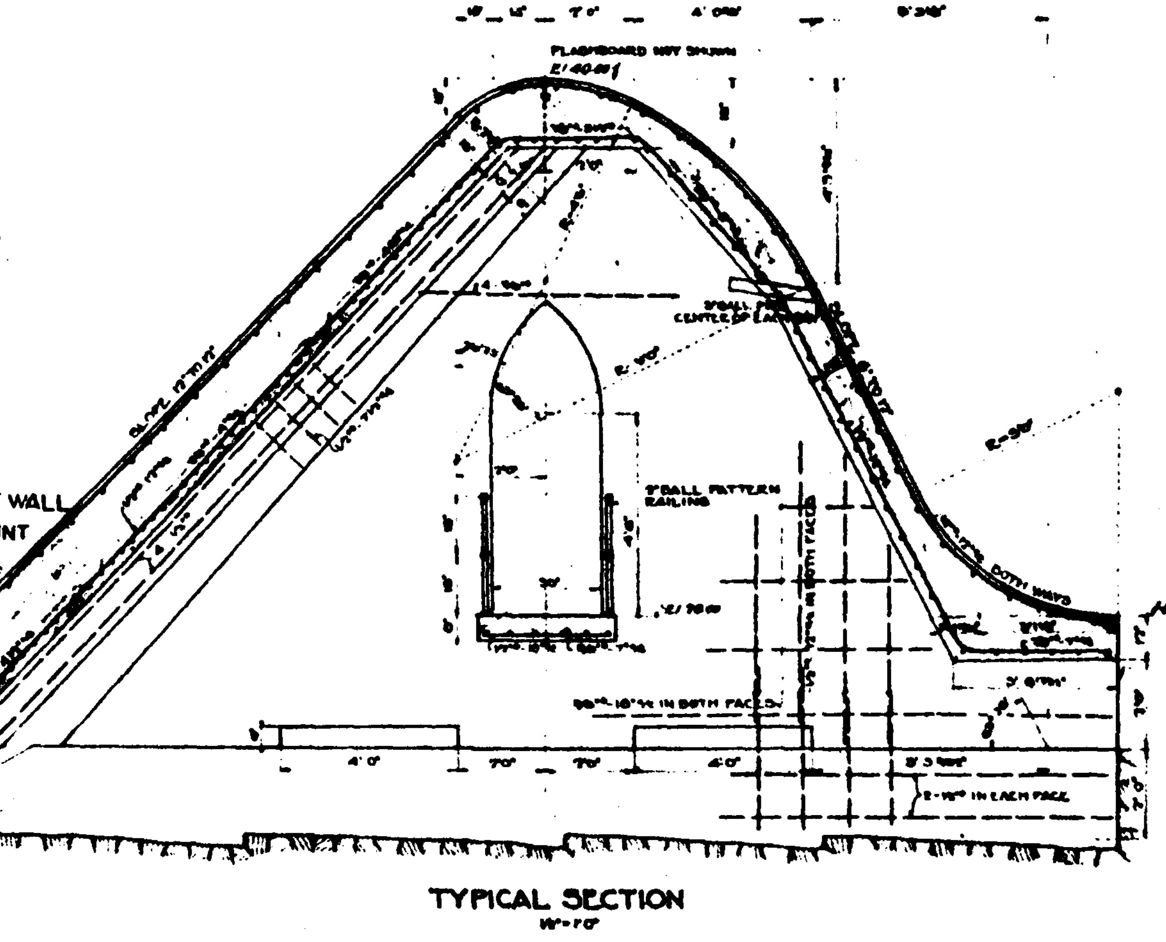
Plate 3



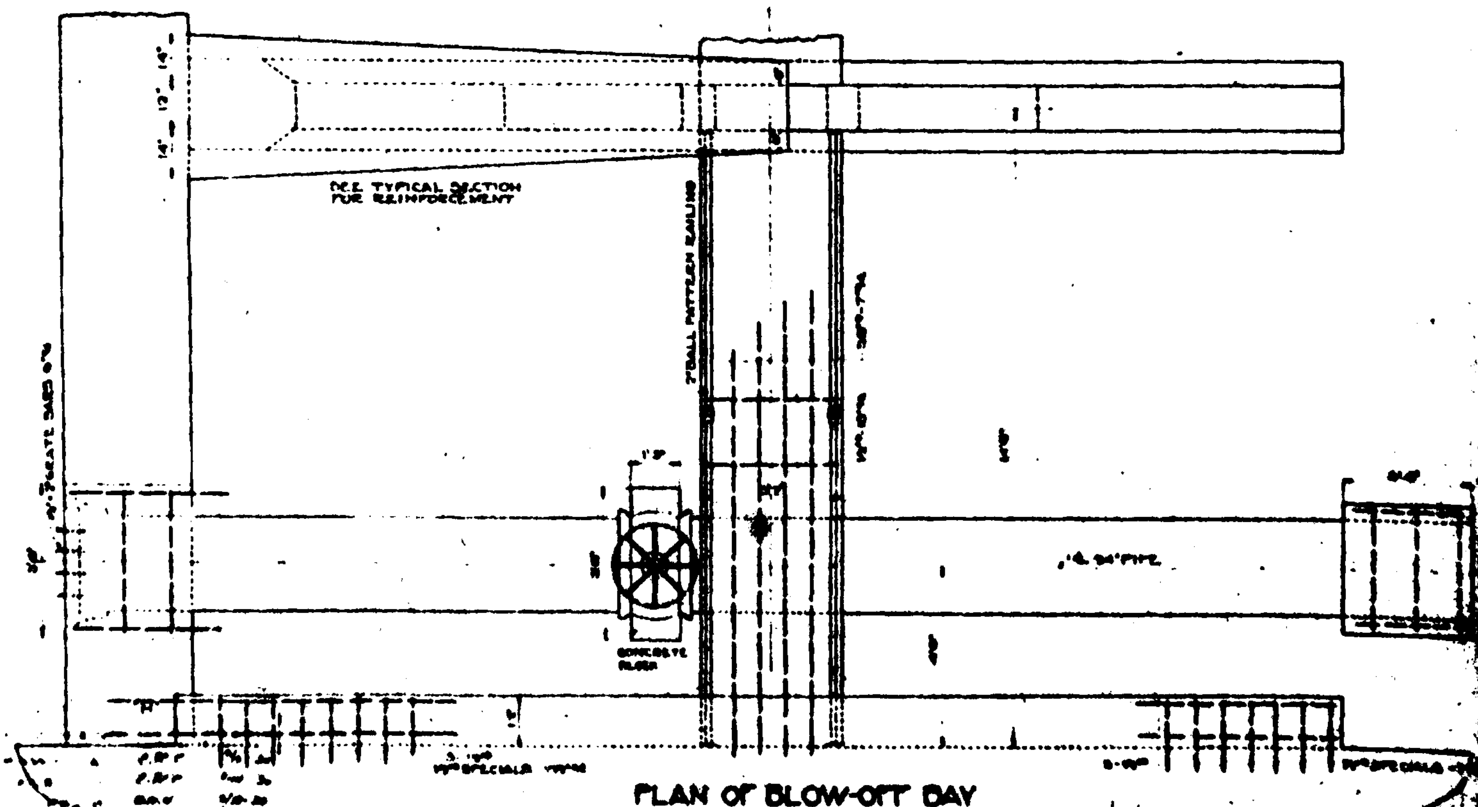
SECTION AA



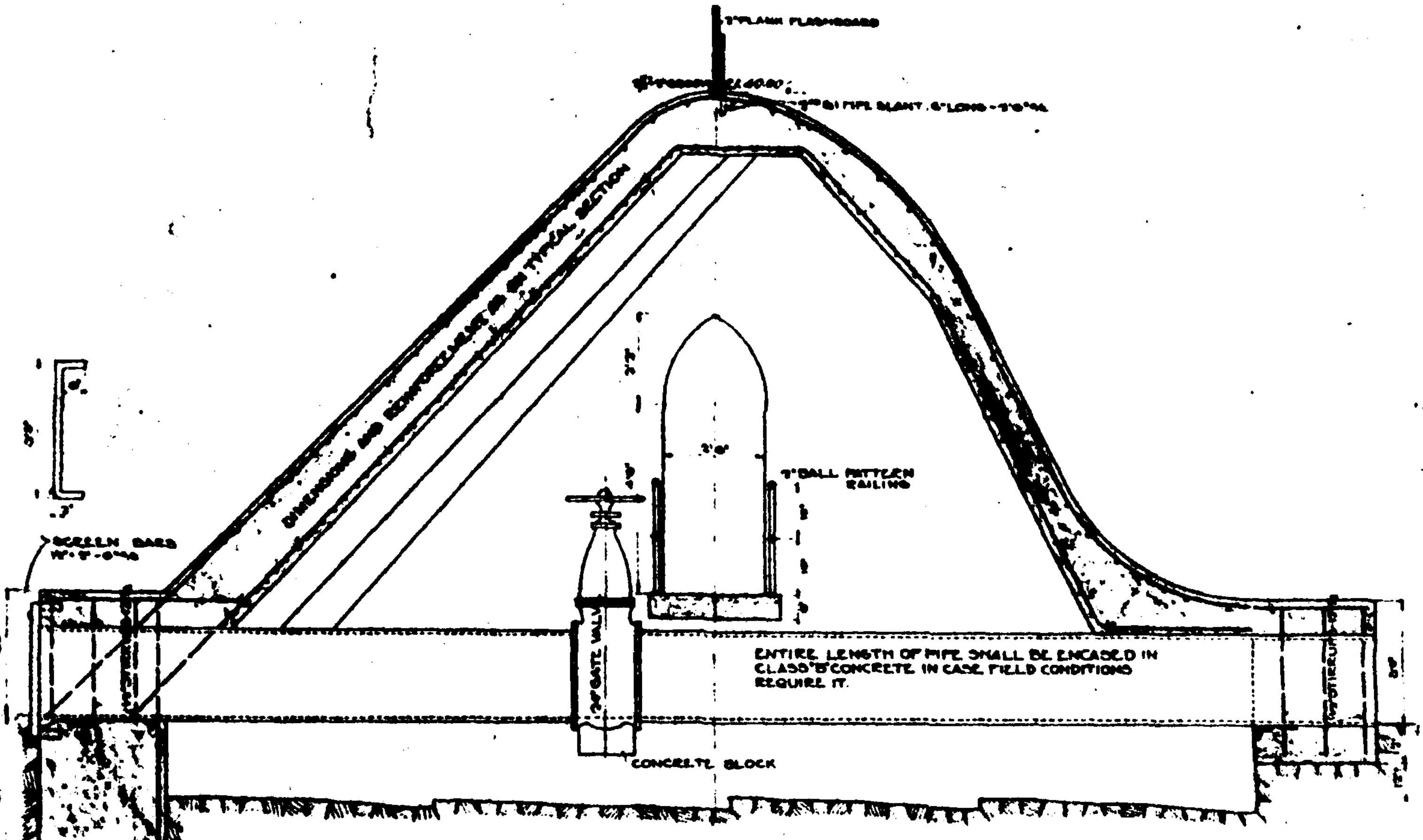
DETAIL OF CUT-OFF WALL
CONSTRUCTION JOINT



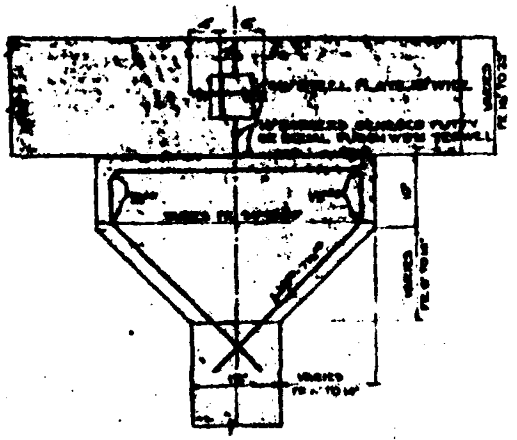

TYPICAL SECTION



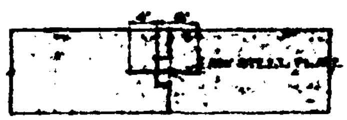

PLAN OF BLOW-OFF BAY
WITH SHELL REMOVED



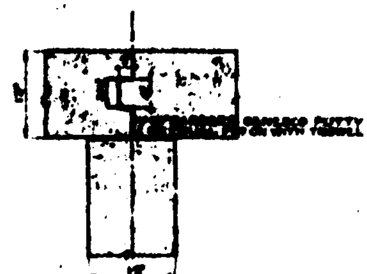

SECTION THRU BLOW-OFF BAY



DECK CONSTRUCTION JOINT



TYPICAL WATERTIGHT CONSTRUCTION JOINT



ROLLWAY CONSTRUCTION JOINT

WESTCHESTER JOINT WATER WORKS No 1

DETAILS OF

DAM AT FILTER PLANT.

LOCATION IV

SCALES AS SHOWN

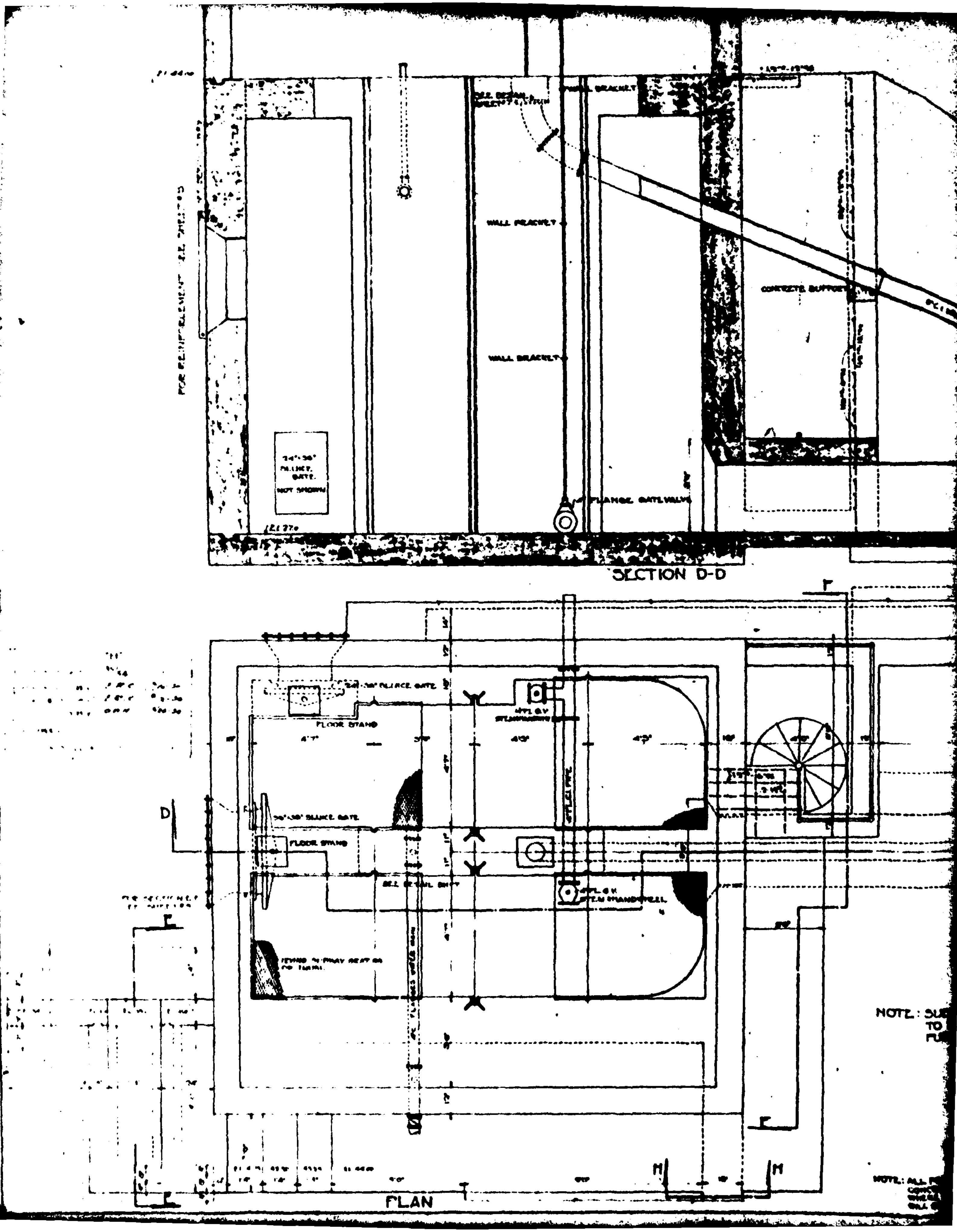
Plate 4

ASSOCIATE ENGINEERS

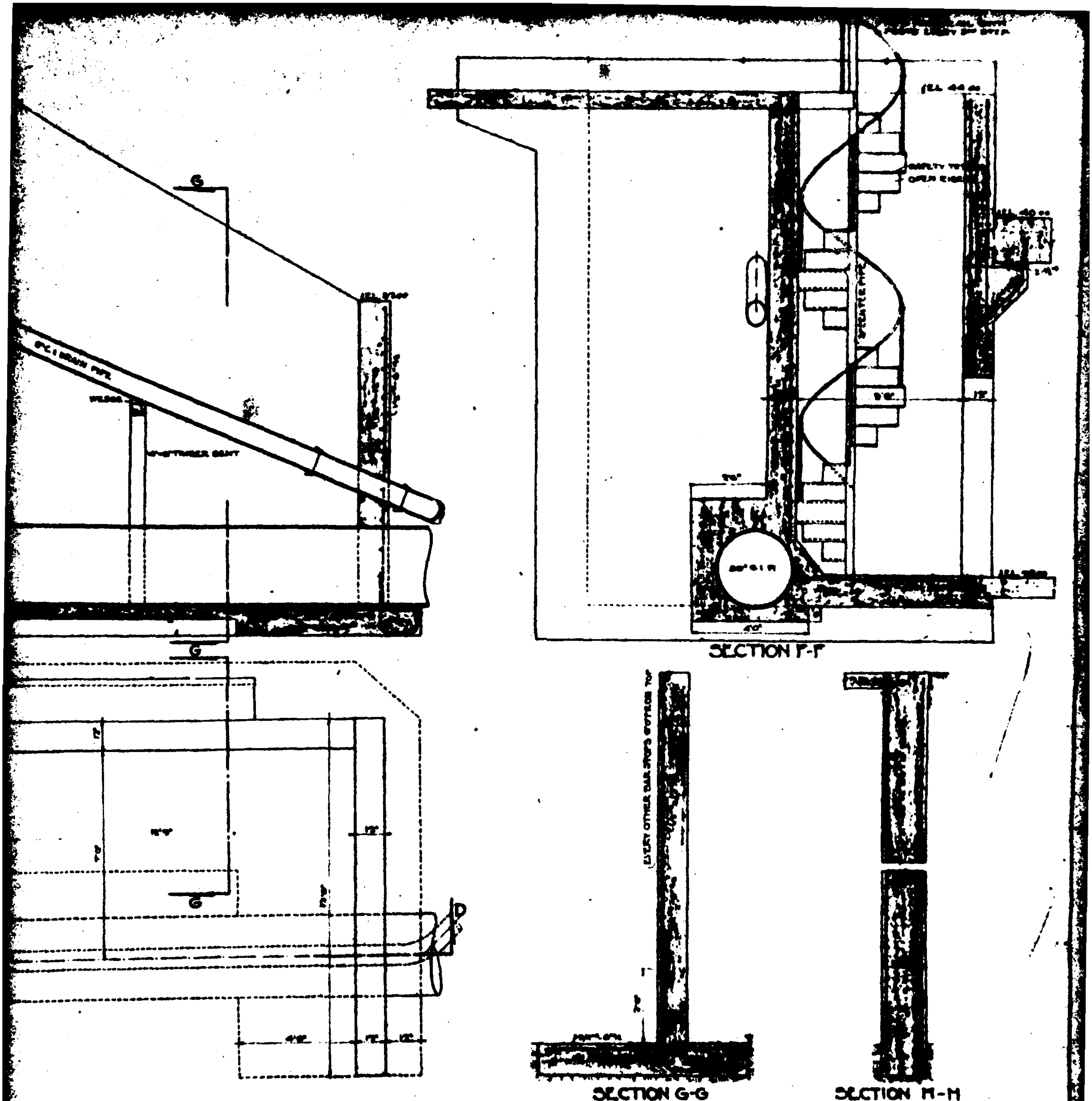
50 CHURCH ST NEW YORK CITY

LARCHMONT N.Y.

JANUARY 1930



WALL BRACKET
WALL BRACKET
WALL BRACKET
CONCRETE BUTTRESS
FLANGE GATE VALVE
NOT SHOWN
SECTION D-D
SLUICE GATE
FLOOR STAND
FLOOR STAND
D
PLAN
NOTE:
NOTE:
H
H




: SUB STRUCTURE SUBJECT TO CHANGE IN ORDER TO MEET REQUIREMENTS OF TYPE OF SCREEN PURCHASED

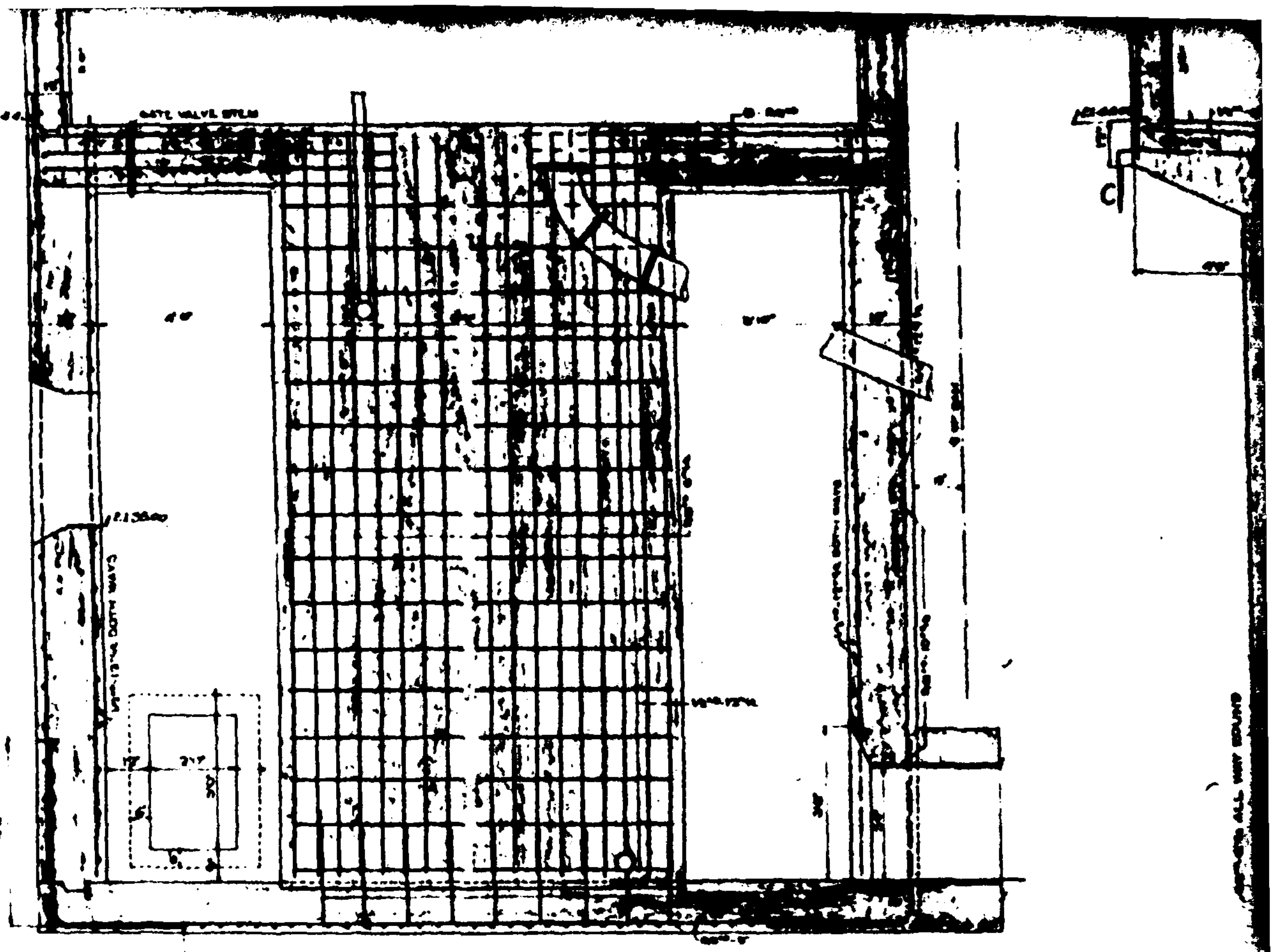
ALL FOOTINGS GO TO ROCK
CONCRETE COVER ON STEEL 3"

WESTCHESTER JOINT WATER WORKS Nº1
DETAILS OF
INTAKE SCREEN HOUSE AND RETAINING WALLS
DAM AT FILTER PLANT
LOCATION IV

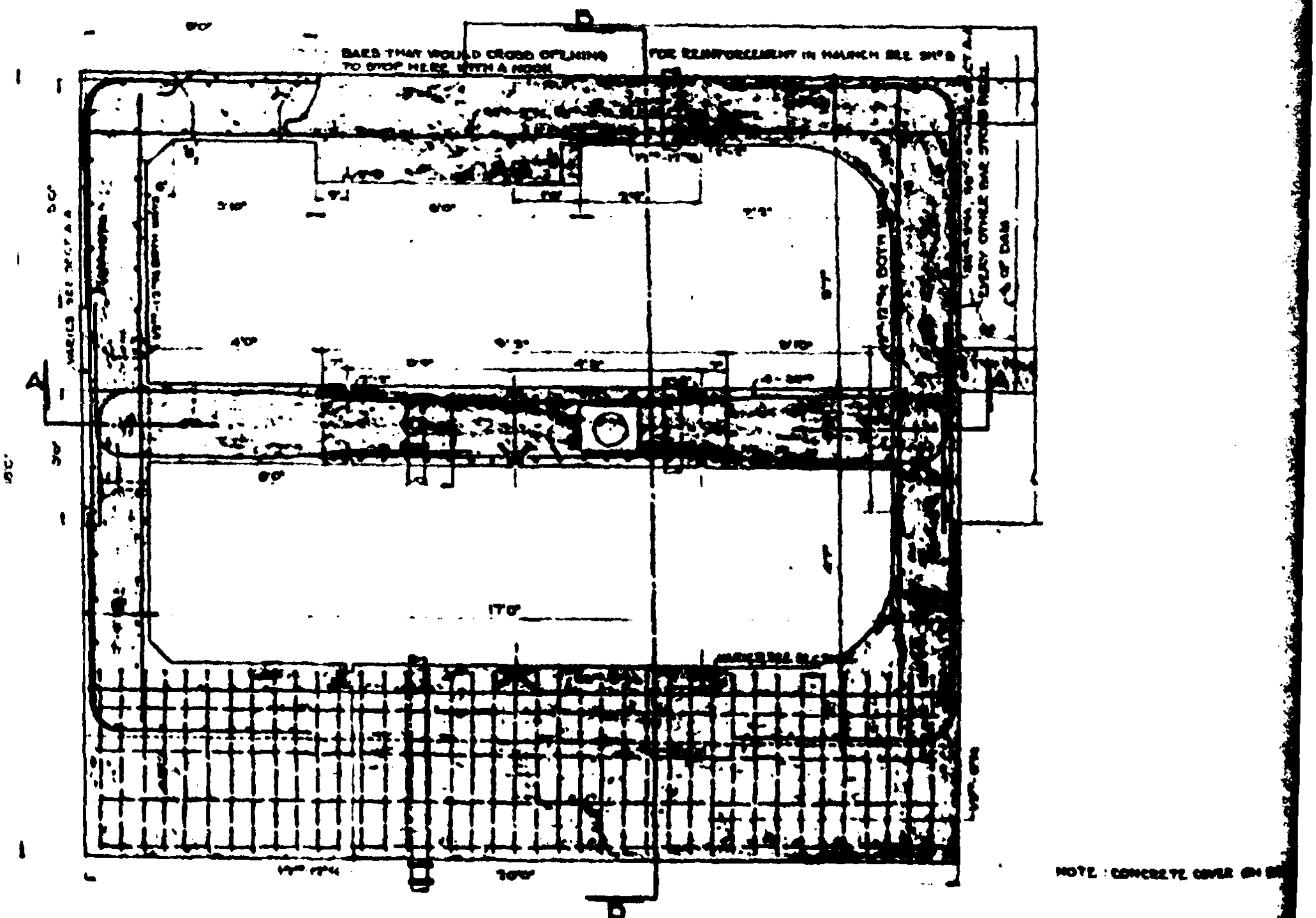
Plate 5

ASSOCIATE ENGINEERS

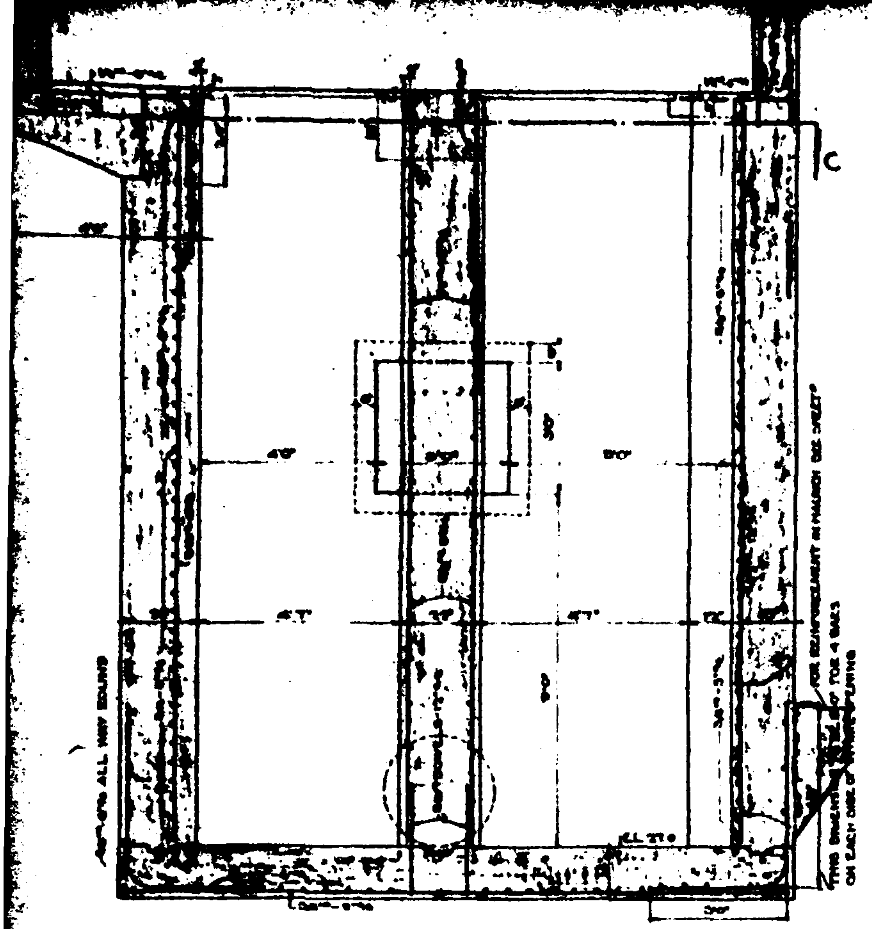
LARCHMONT N.Y.



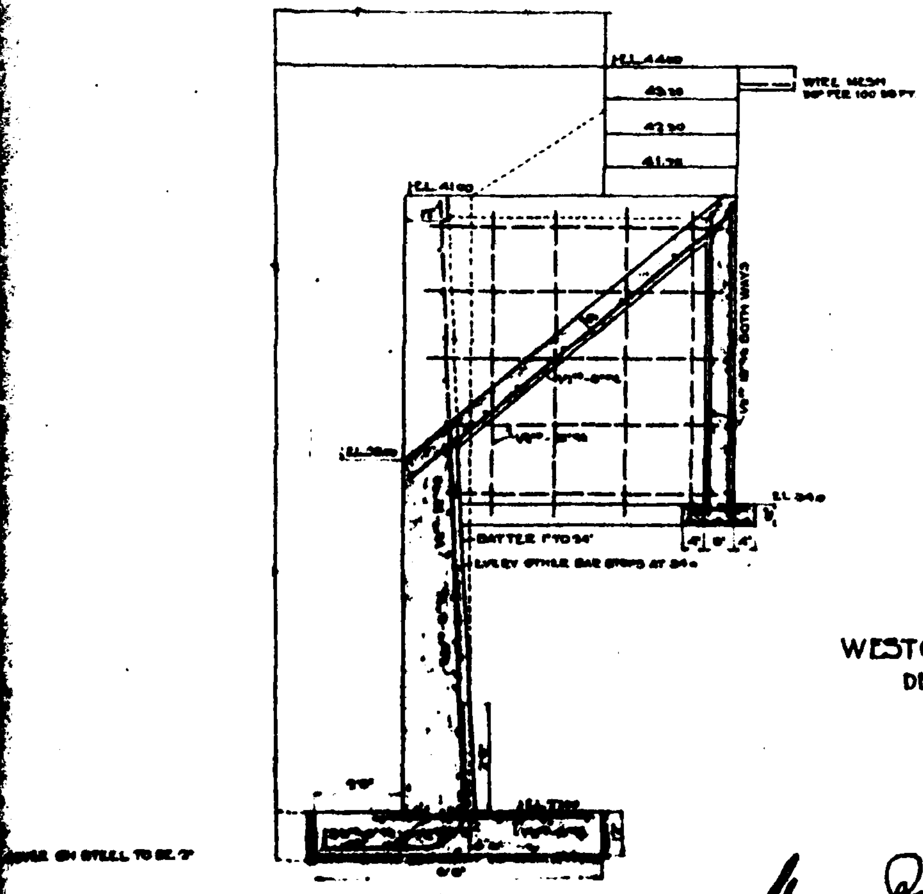

SECTION AA




SECTION C-C



SECTION B-B



SECTION E-E
SEE SHEET #4

WESTCHESTER JOINT WATER WORKS No. 1
DETAILS OF REINFORCED CONCRETE
INTAKE AND SCREEN CHAMBER
DAM AT FILTER PLANT

LOCATION IV

SCALE: 1/4"=1'0"

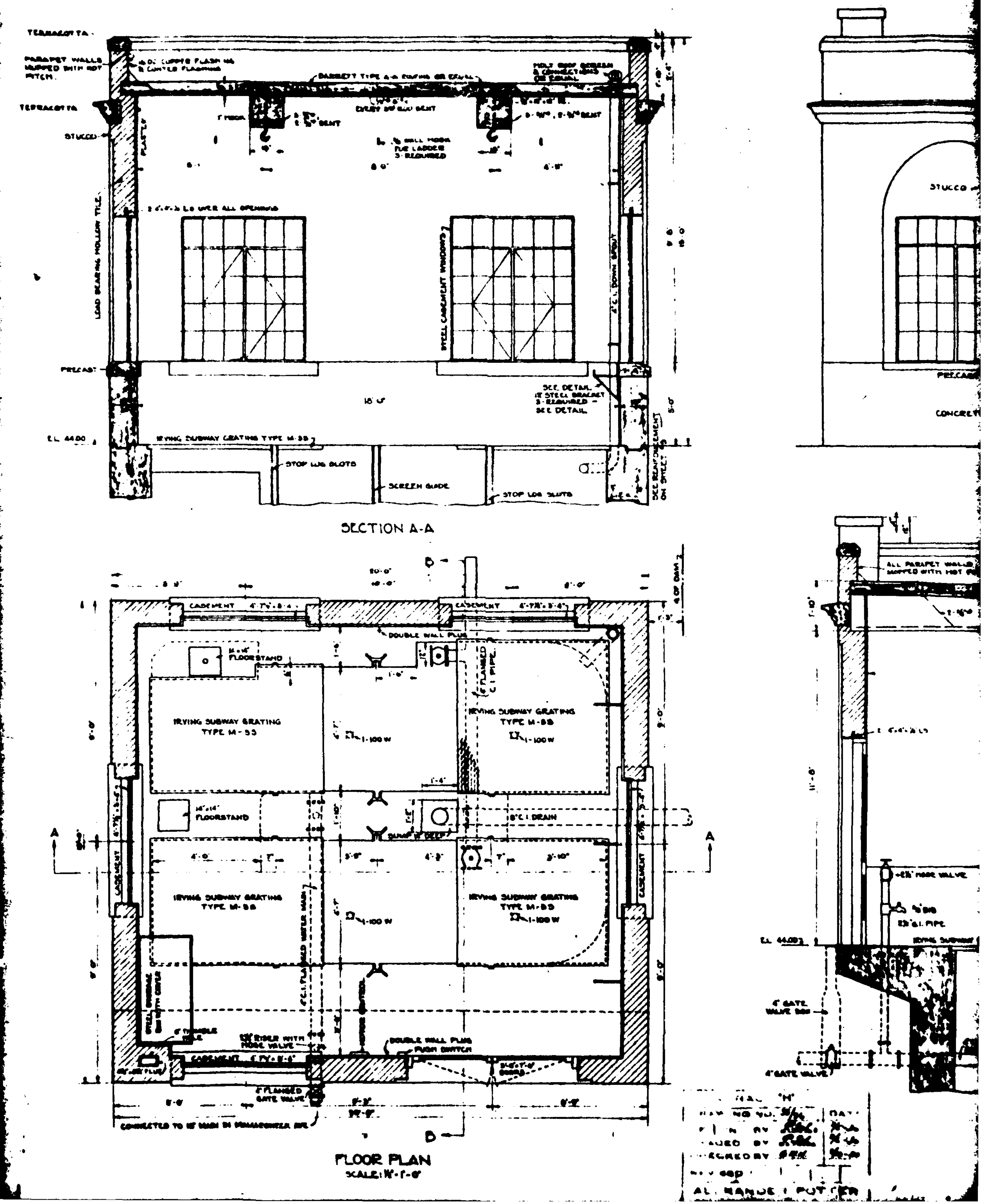
Plate 6

ASSOCIATE ENGINEERS

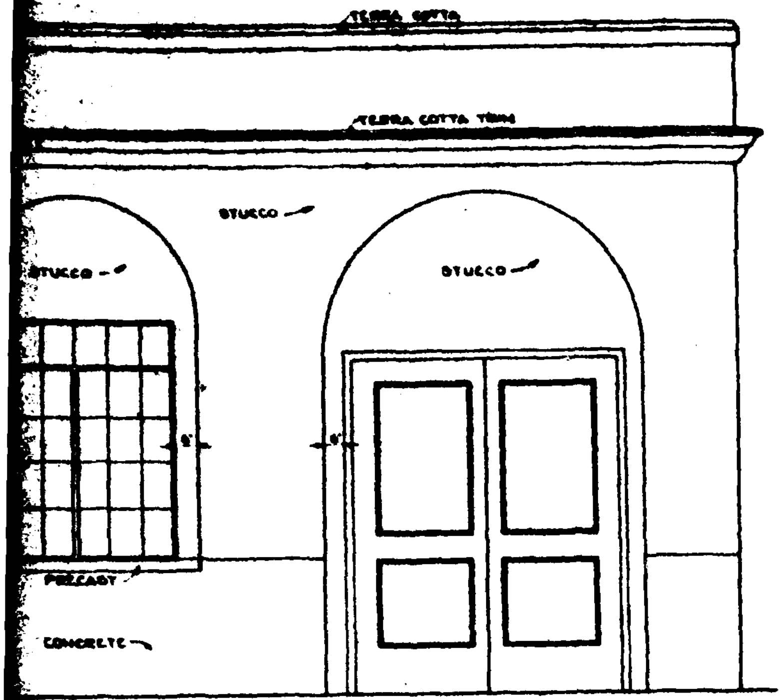
30 CHURCH ST. NEW YORK CITY

LARCHMONT N.Y.

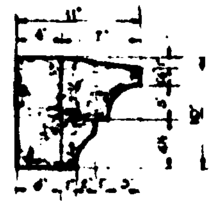
JANUARY 1930



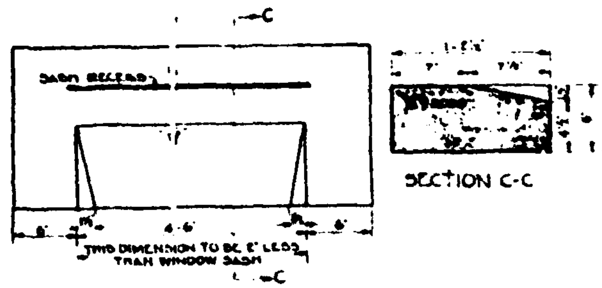
TERRACOTTA
PARAPET WALLS MOPPED WITH HOT PITCH
STUCCO
LOAD BEARING HOLLOW TILE
PRECAST
EL. 44.00
IRVING SUBWAY GRATING TYPE M-55
STOP LOG SLOTS
SCREEN GUIDE
STEEL CASEMENT WINDOWS
SEE DETAIL
SECTION A-A
FLOORSTAND
IRVING SUBWAY GRATING TYPE M-55
DOUBLE WALL PLUG
CASEMENT
8" C.I. DRAIN
PUSH SWITCH
4" FLANGED GATE VALVE
CONNECTED TO 12" MAIN IN MANAGEMENT AVE.
FLOOR PLAN
SCALE: 1/4" = 1'-0"
STUCCO
PRECAST
CONCRETE
ALL PARAPET WALLS MOPPED WITH HOT PITCH
HOSE VALVE
4" GATE VALVE
AL. NANDE & POTTER



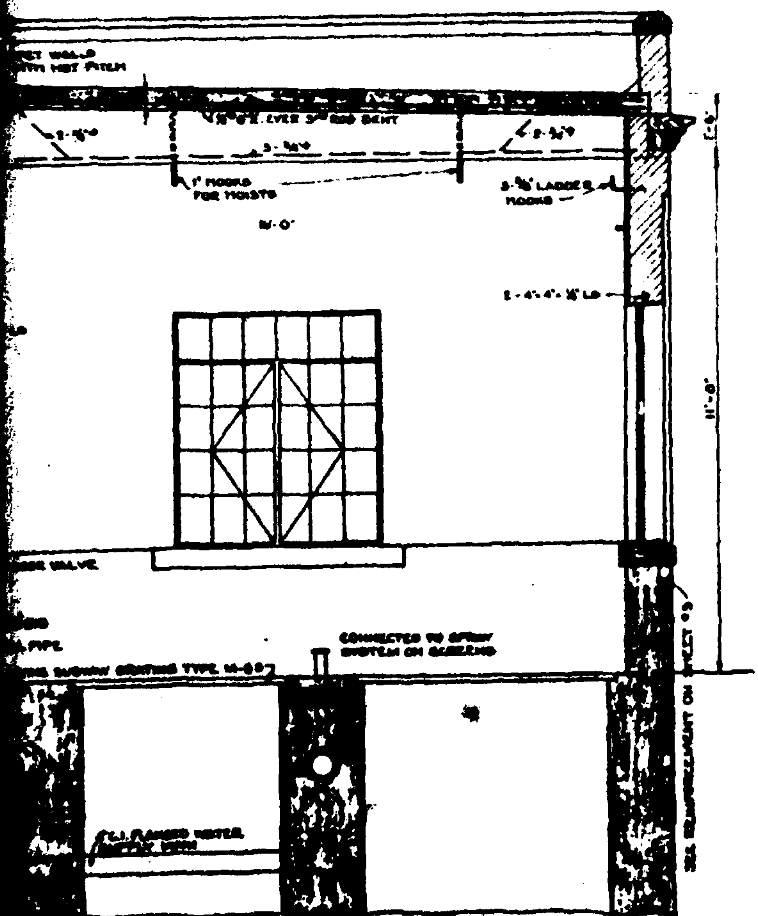

WEST ELEVATION



DETAIL OF
TERRA COTTA TRIM
SCALE: 1½"=1'-0"




DETAIL OF PRECAST WINDOW SILL
SCALE: ½"=1'-0"




SECTION B-B
SCALE: ½"=1'-0"

WESTCHESTER JOINT WATER WORKS No. 1.

INTAKE SCREEN HOUSE

DAM AT FILTER PLANT

LOCATION IV

SCALES AS SHOWN

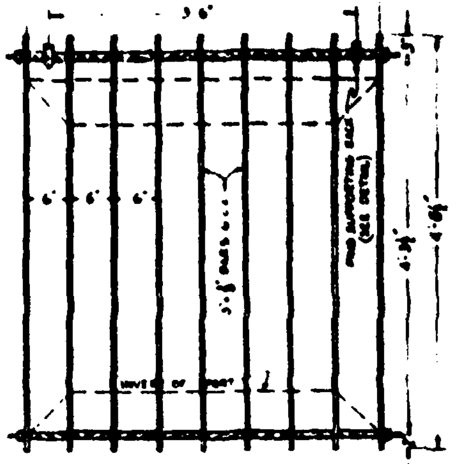
Plate 7.

ASSOCIATE ENGINEERS

50 CHURCH ST., NEW YORK CITY

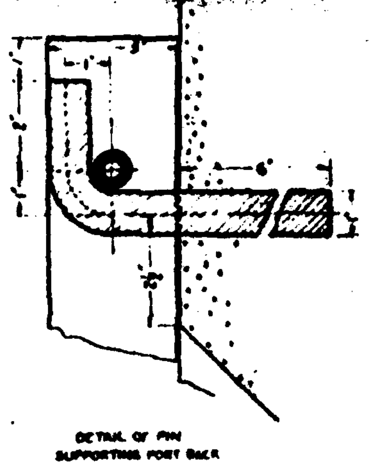
LARCHMONT, N.Y.

JANUARY 1930



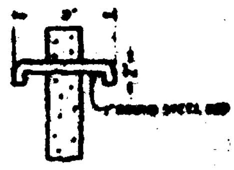
FRONT ELEVATION

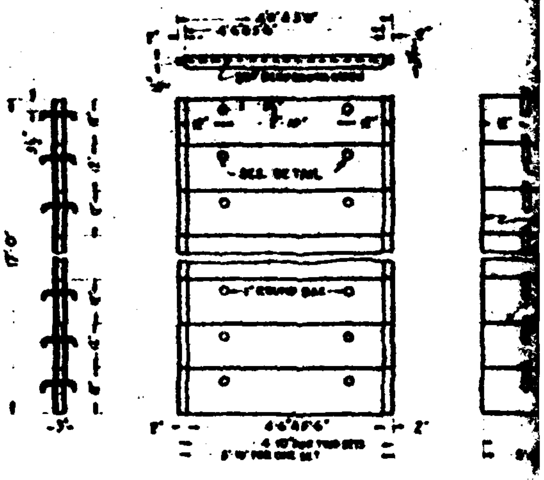
1" = 1'0"



SECTIONAL ELEVATION

1/2" = 1'0"

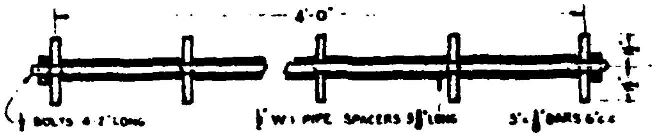




CONCRETE STOP PLANKS

IF ONE SCREEN IS INSTALLED TWO SETS OF 4'10" AND ONE SET OF 3'10"

1/2" = 1'0"

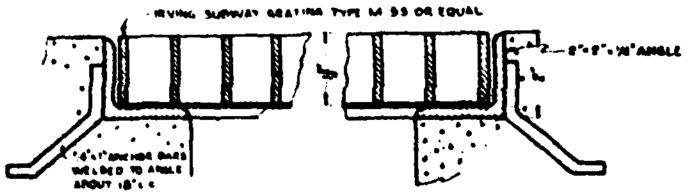


SECTION ON ℄ BOLT

3" = 1'0"

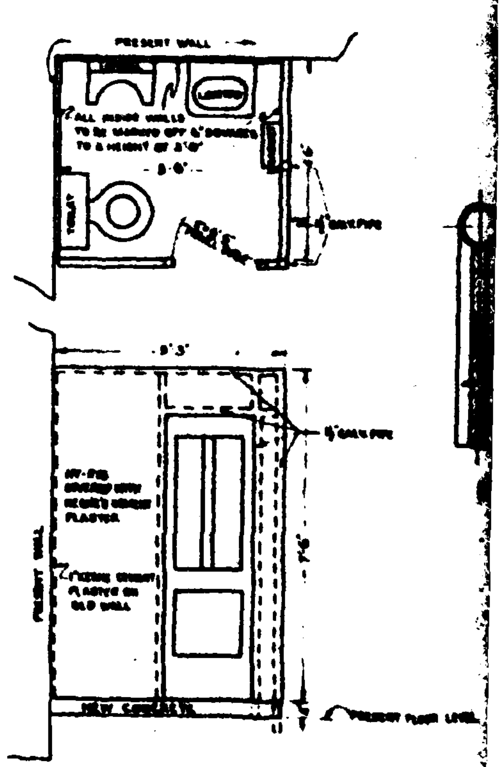
DETAILS OF PORT TRASH RACKS

TWO REQUIRED



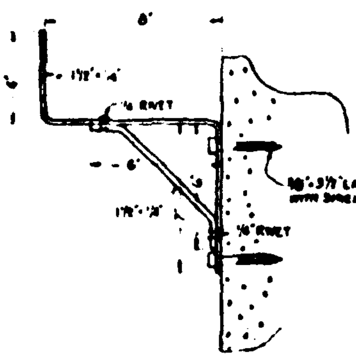
DETAILS OF FLOOR GRATING

1/2" = 1'0"



LAVATORY TO BE INSTALLED IN SW COR OF PRESENT PUMP ROOM

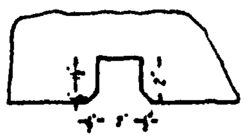
1/2" = 1'0"



DETAIL OF TOOL BRACKET

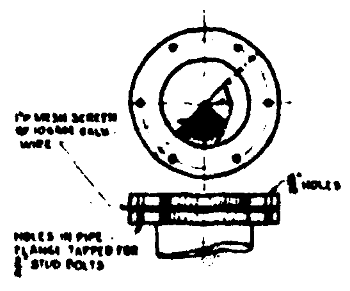
THREE REQUIRED

1 1/2" = 1'0"



DETAIL OF STOP PLANK RECESS

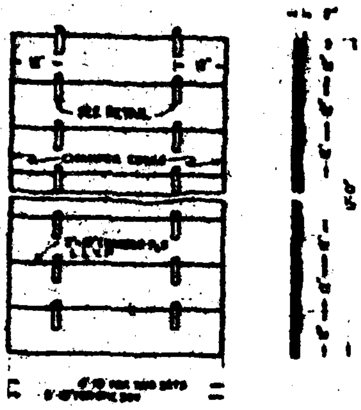
1 1/2" = 1'0"



DETAIL OF SCREEN DRAIN

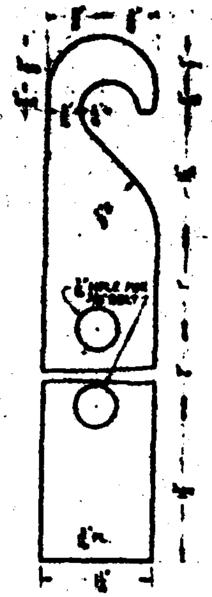
1 1/2" = 1'0"

DETAIL OF HOOK RODS IN CONCRETE STOP PLANKS



**WOODEN STOP PLANKS**

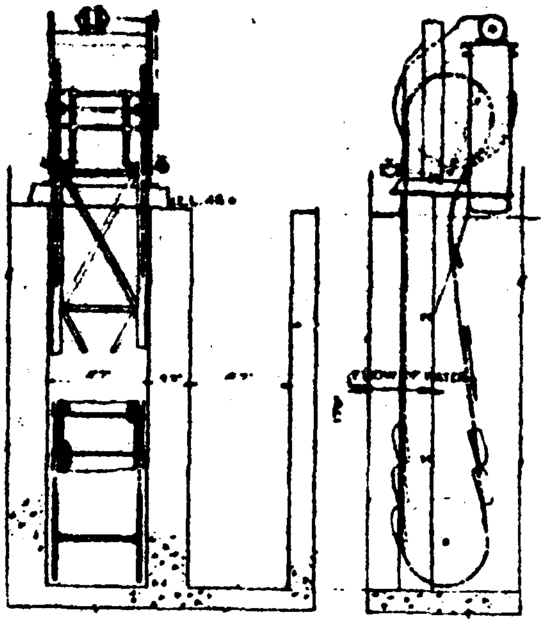
IF TWO SCREENS ARE INSTALLED, TWO SETS OF 4'-10" AND ONE SET OF 5'-10"



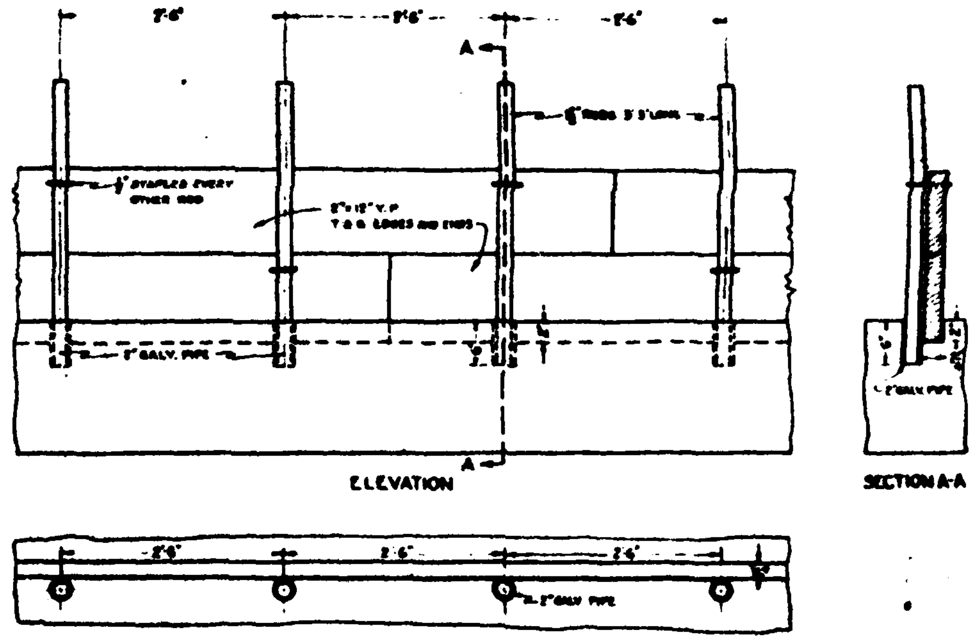
**DETAIL OF HOOKS FOR STOP PLANKS**

TWO REQUIRED FOR EACH PLANK

1"-1'0"



**MECHANICALLY OPERATED VERTICAL SCREEN**



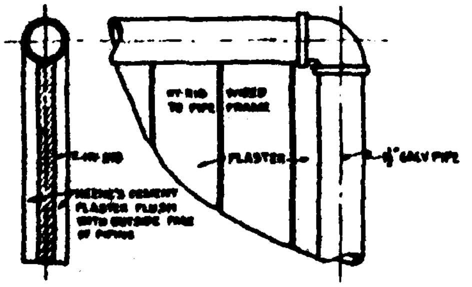
ELEVATION

SECTION A-A

PLAN

RODS AND PLANKS REMOVED

**DETAIL OF FLASH BOARD CONSTRUCTION**



**DETAIL OF LAVATORY PARTITION**

WESTCHESTER JOINT WATER WORKS No 1.

DETAILS

DAM AT FILTER PLANT

LOCATION IV

SCALED AS SHOWN

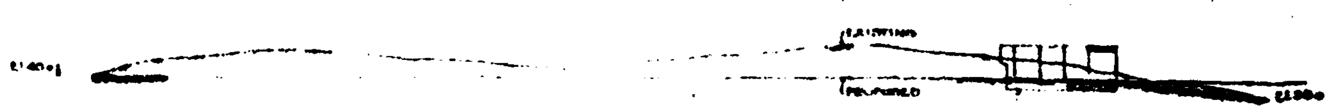
Plate 8

ASSOCIATE ENGINEERS

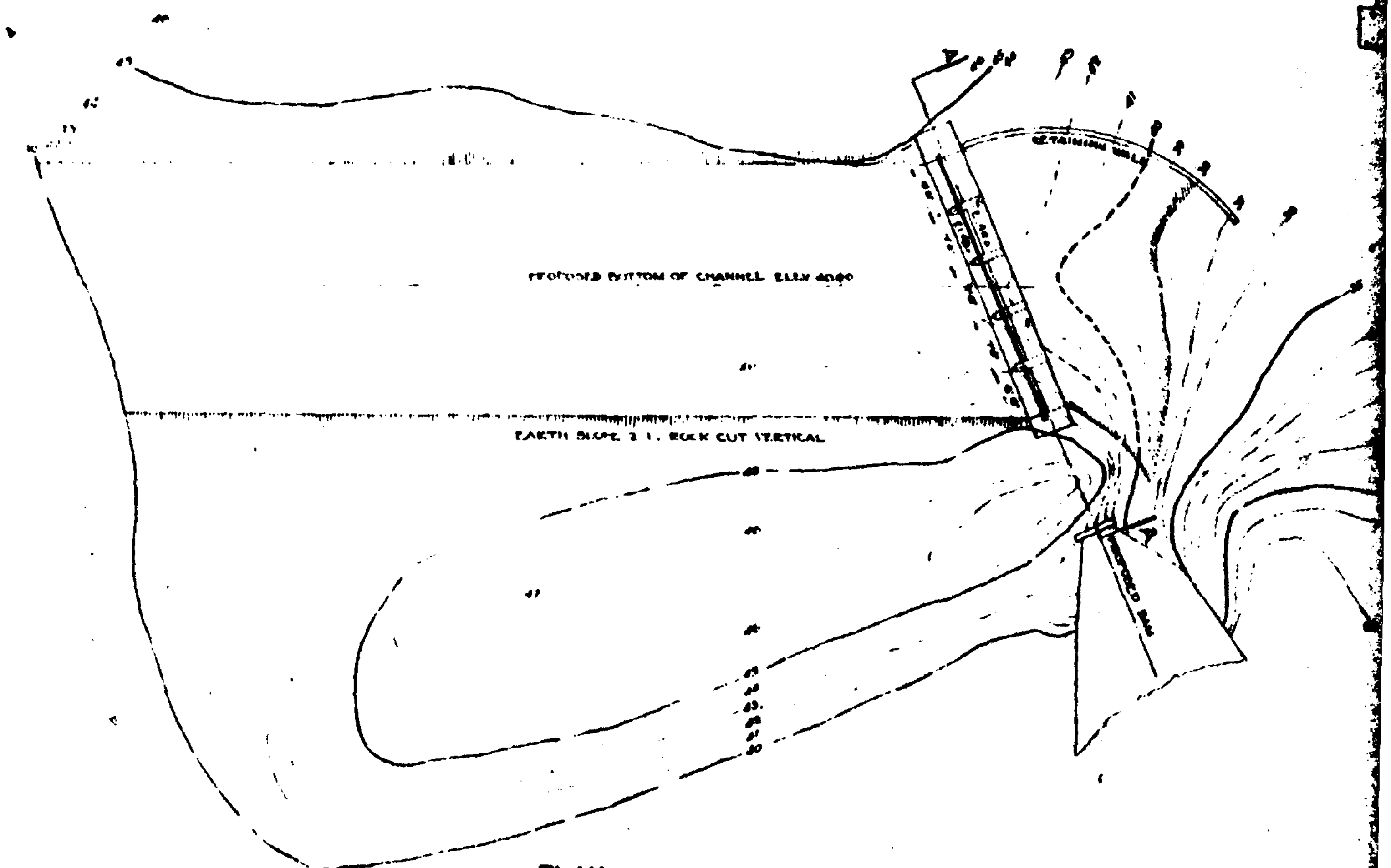
50 CHURCH ST., NEW YORK CITY

LARCHMONT, N.Y.

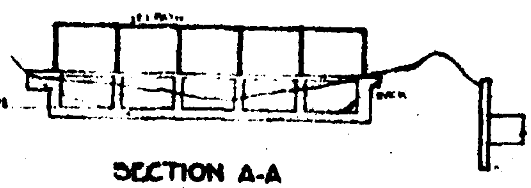
JANUARY [illegible]




PROFILE ALONG ℄ OF CHANNEL



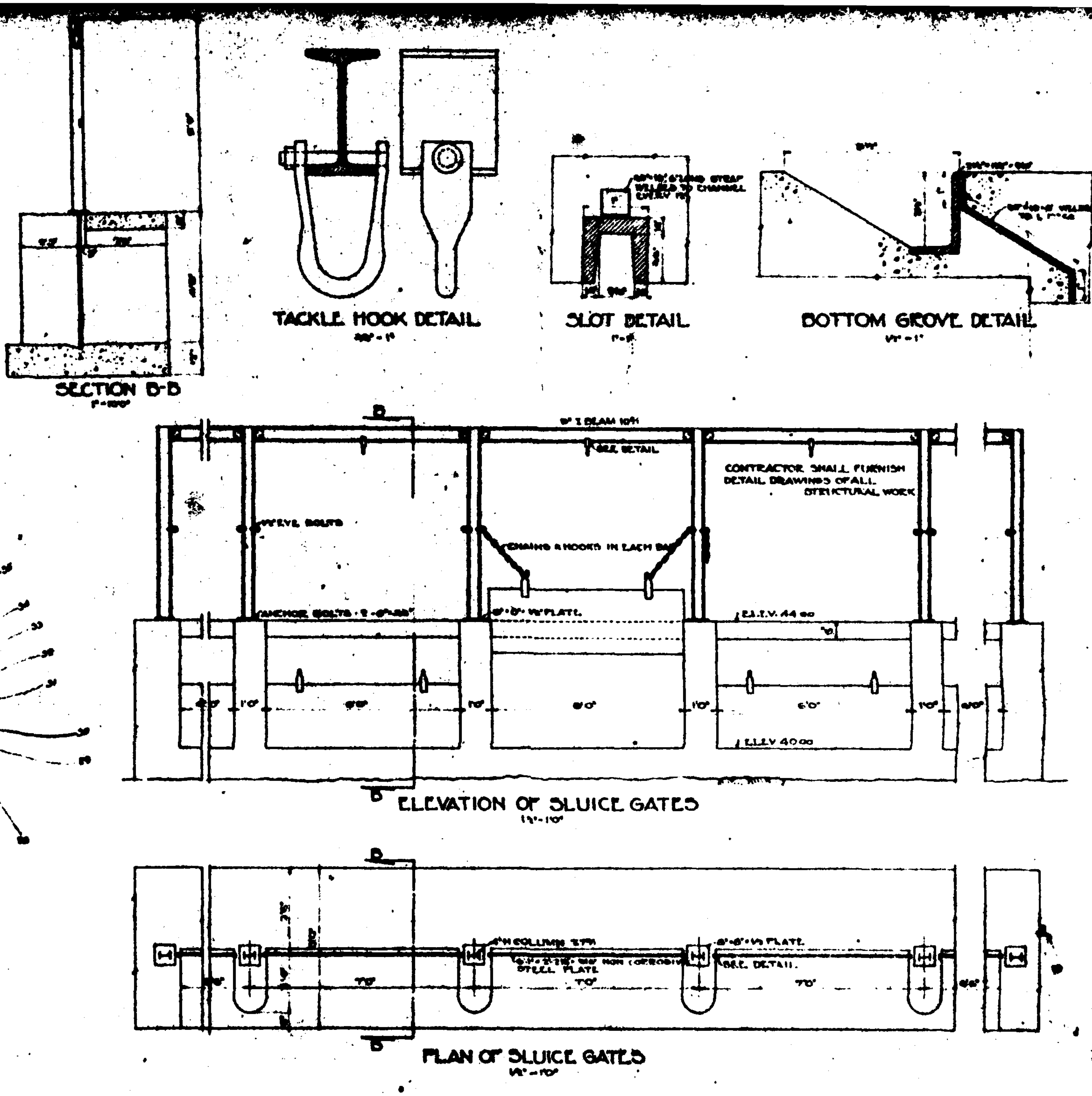

PLAN



SECTION A-A

"H"

DRAWN BY
TRACED BY
CHECKED BY




WESTCHESTER JOINT WATER WORKS No 1

SLUICE GATES

DAM AT FILTER PLANT

LOCATION IX

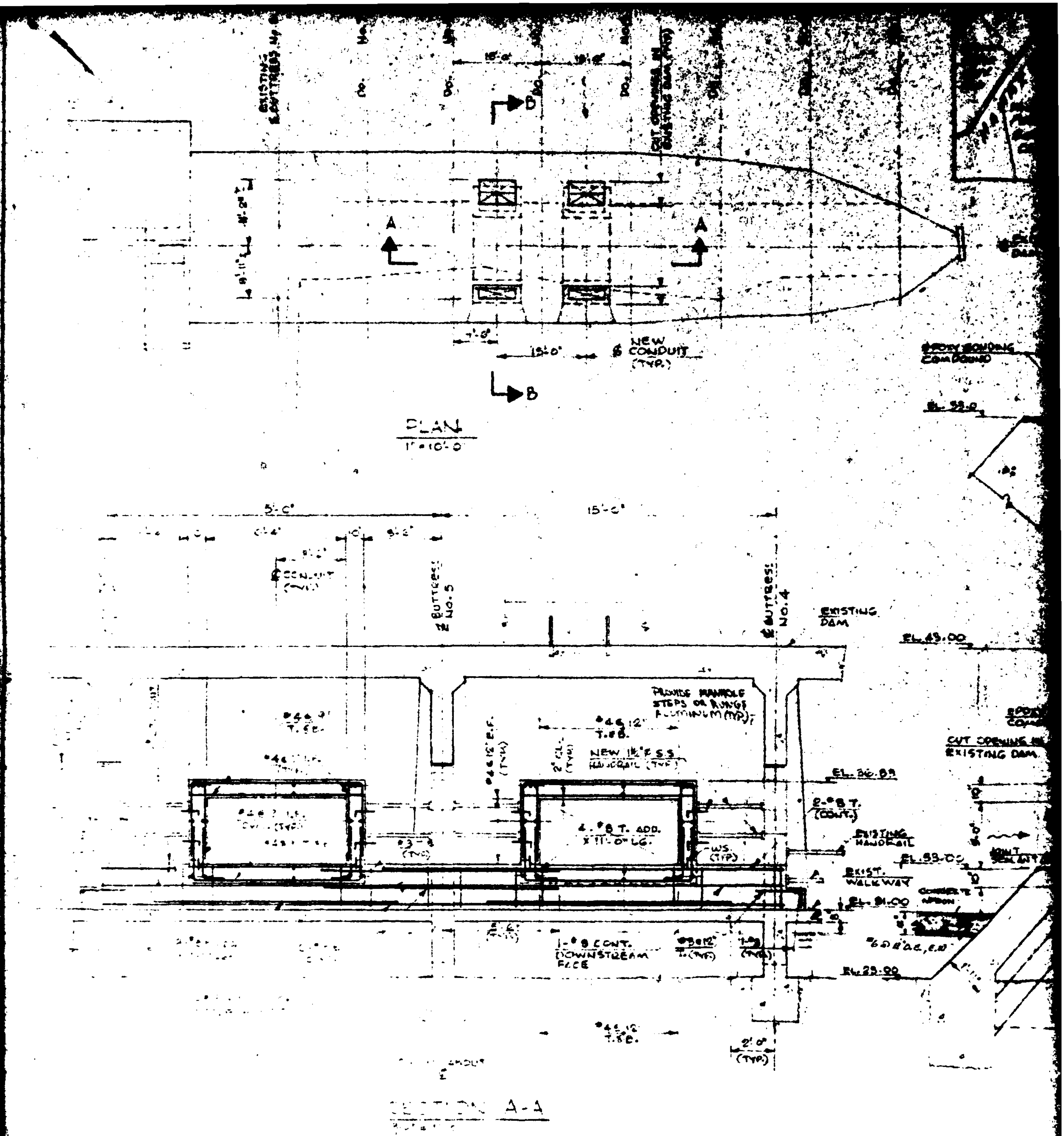
SCALES AS SHOWN

Plate 9

ASSOCIATE ENGINEERS

50 CHURCH ST. NEW YORK CITY

LARCHMONT, N.Y.




COUNTY OF WESTCHESTER
DEPARTMENT OF PUBLIC WORKS

RECOMMENDED

RUDOLPH C. PETRUCCELLI
DESIGN COORDINATOR
RECOMMENDED

EDWARD M. McCABE
DIRECTOR OF ENGINEERING RECOMMENDED

FRANK T. KEARNEY
1st DEPUTY COMMISSIONER

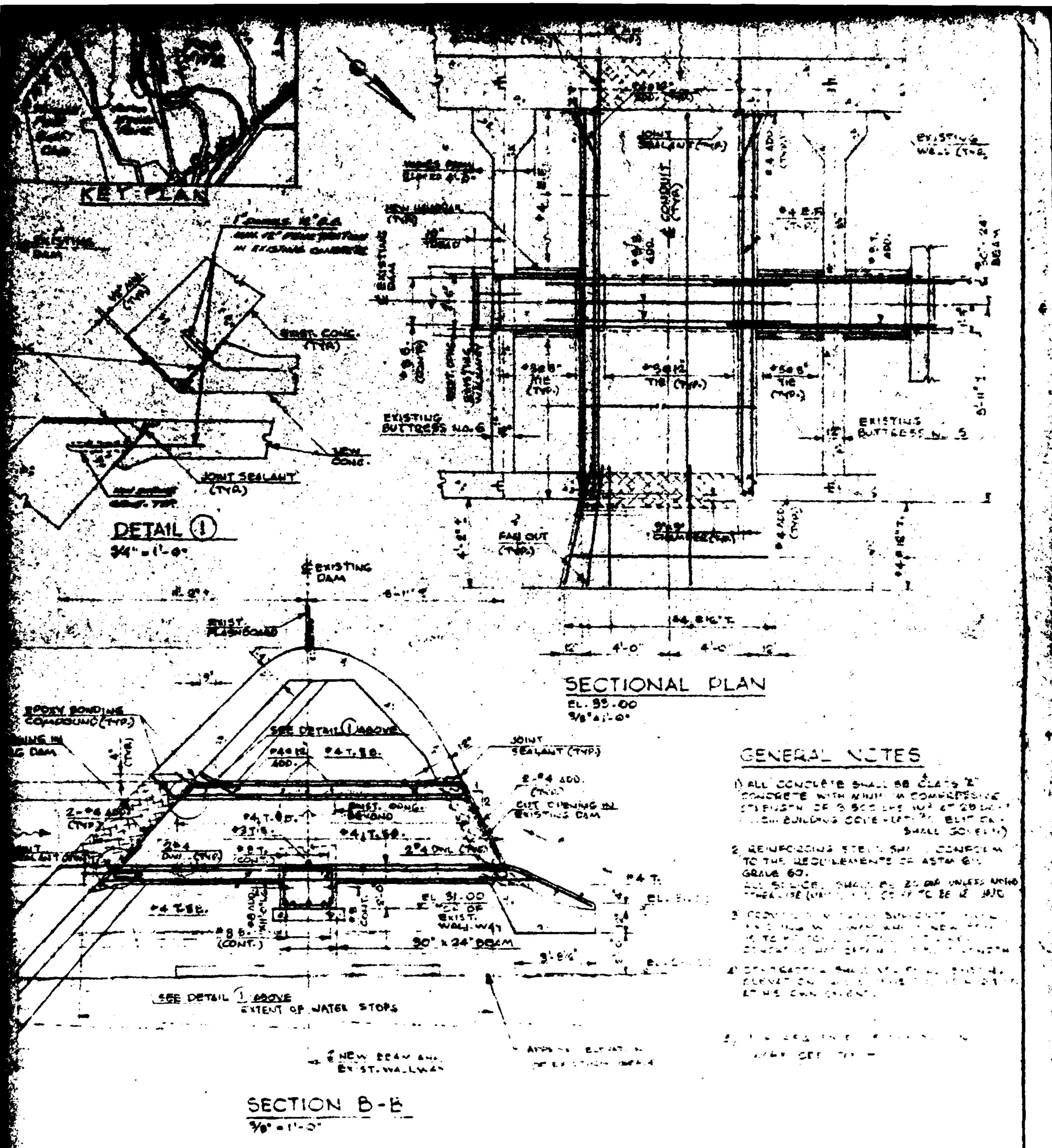
VILLAGE OF MA

APPROVED

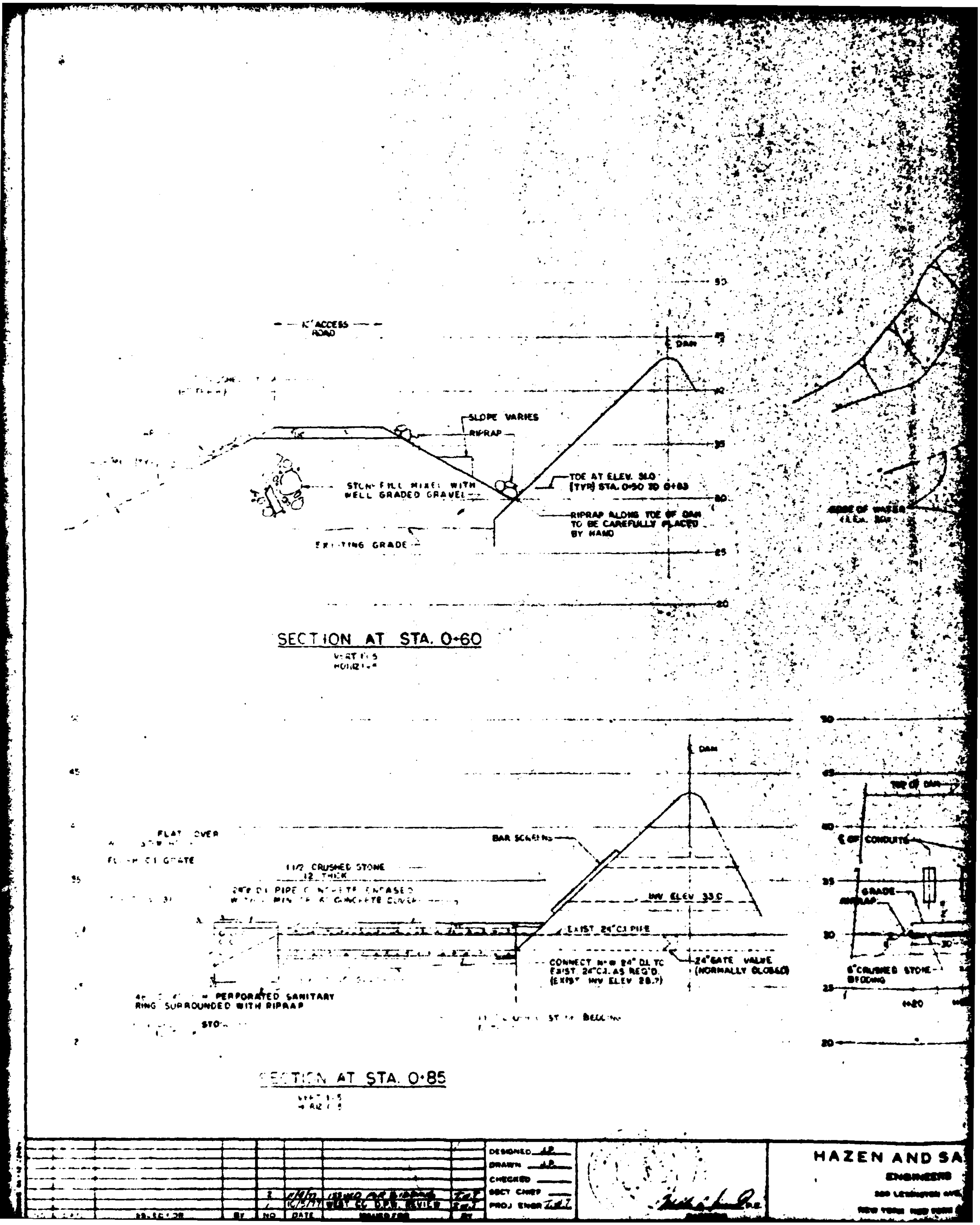
| | | | | | | |
|---|---|---|---|---|---|---|
| | | 3 | | ISSUED FOR BIDDING | | |
| | | 2 | | ADD STEPS, DOWELS, W.S. | | |
| | | 1 | | | | |
| | BY | NO. | DATE | ISSUED FOR | BY | |

DESIGNED
DRAWN
CHECKED
SECT. CHIEF
PROJ. ENGR.

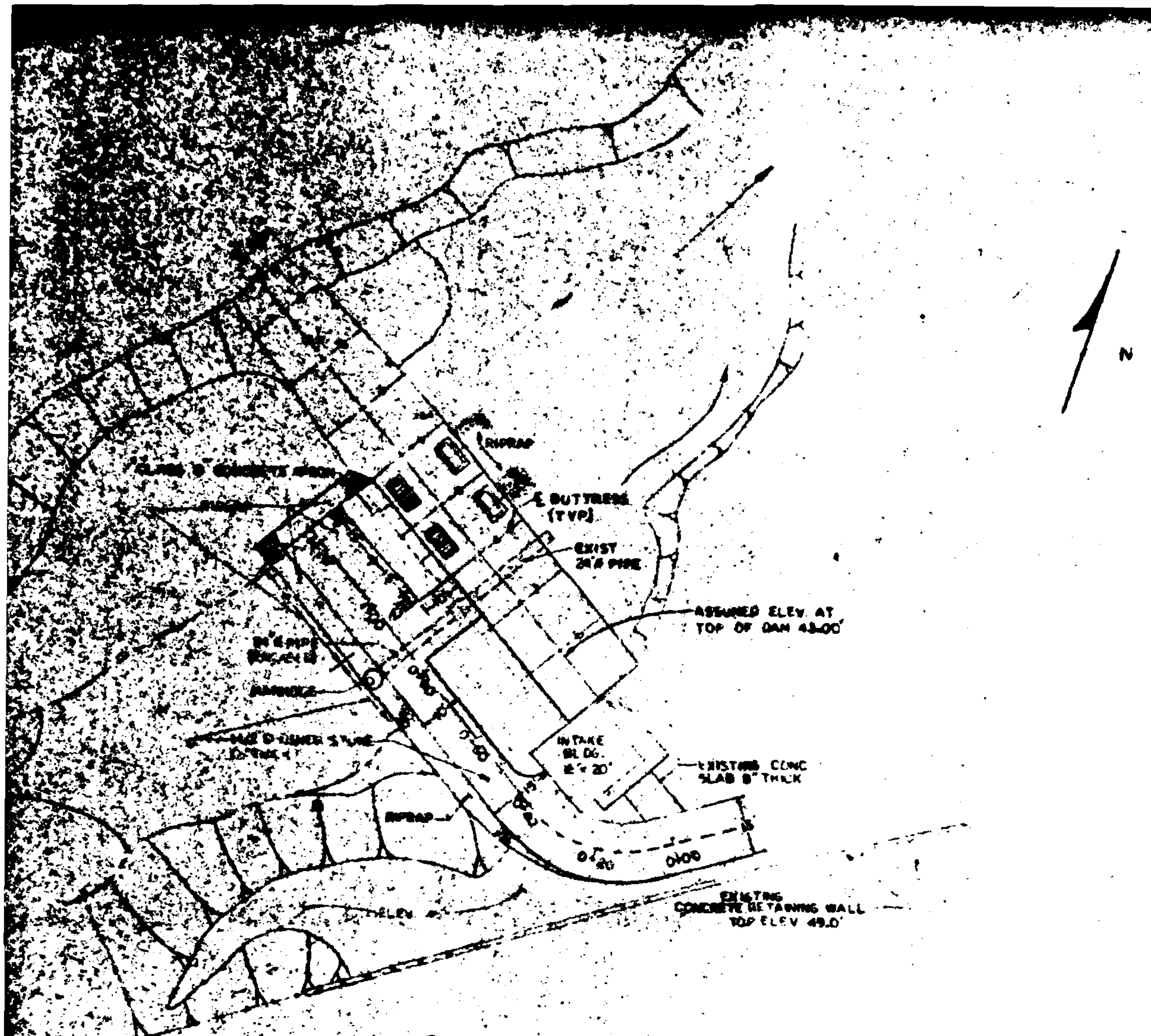
HAZEN AND SAW
ENGINEERS
360 LEXINGTON AVE.



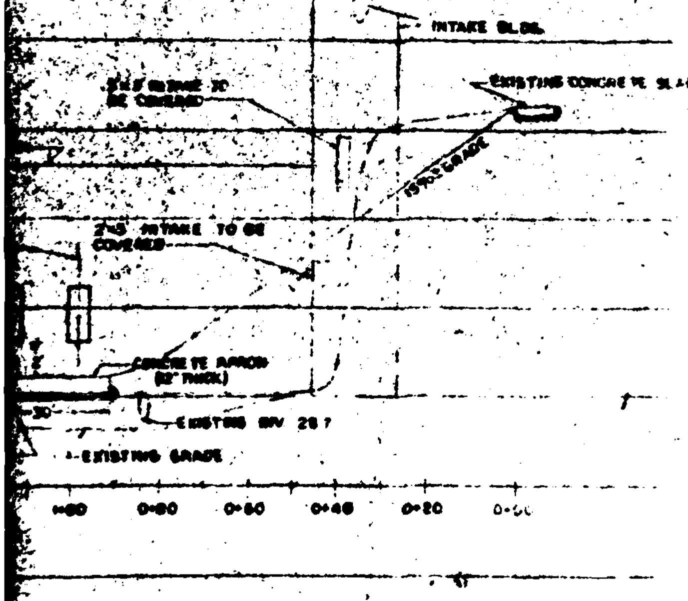

| | | | |
|---|---|---|---|
| ...E OF MAMARONECK<br>ARMAND J. GIANUNZIO<br>VILLAGE MANAGER | COUNTY OF WESTCHESTER<br>DEPARTMENT OF PLANNING<br>APPROVED PETER ESCHWEILER<br>COMMISSIONER | WESTCHESTER JOINT WATER WORKS<br>MAMARONECK, N.Y.<br>APPROVED JOHN & HOCK P.E.<br>MANAGER | Plate 10 |
| ...D. SAWYER / SCALE: AS SHOWN | COUNTY OF WESTCHESTER<br>DEPARTMENT OF PUBLIC WORKS<br>APPROVED FRANK C. BOHLANDER<br>COMMISSIONER | MODIFICATIONS OF WESTCHESTER JOINT WATER WORKS DAM<br>CONTRACT NO. 2315<br>TWIN CONDUIT DETAILS | DATE 1/8/79<br>SHEET 1 OF 4<br>DWG 81-01-C-1-0 |



10' ACCESS ROAD
℄ DAM
SLOPE VARIES
RIPRAP
STONE FILL MIXED WITH WELL GRADED GRAVEL
TOE AT ELEV. 31.0 (TYP) STA. 0+50 TO 0+83
RIPRAP ALONG TOE OF DAM TO BE CAREFULLY PLACED BY HAND
EXISTING GRADE
EDGE OF WATER ELEV. 30±
50
45
40
35
30
25
20
SECTION AT STA. 0+60
FLAT OVER
FLUSH C.I. GRATE
BAR SCREENS
1 1/2 CRUSHED STONE 12" THICK
24" D.I. PIPE CONCRETE ENCASED
INV ELEV 33.0
EXIST 24" C.I. PIPE
CONNECT NEW 24" D.I. TO EXIST. 24" C.I. AS REQ'D. (EXIST INV ELEV 28.7)
24" GATE VALVE (NORMALLY CLOSED)
PERFORATED SANITARY RING SURROUNDED WITH RIPRAP
SECTION AT STA. 0+85
TOP OF DAM
℄ OF CONDUITS
GRADE
RIPRAP
6" CRUSHED STONE BEDDING
DESIGNED
DRAWN
CHECKED
SECT CHIEF
PROJ ENGR
NO
DATE
BY
HAZEN AND SA
ENGINEERS




PLAN




PROFILE

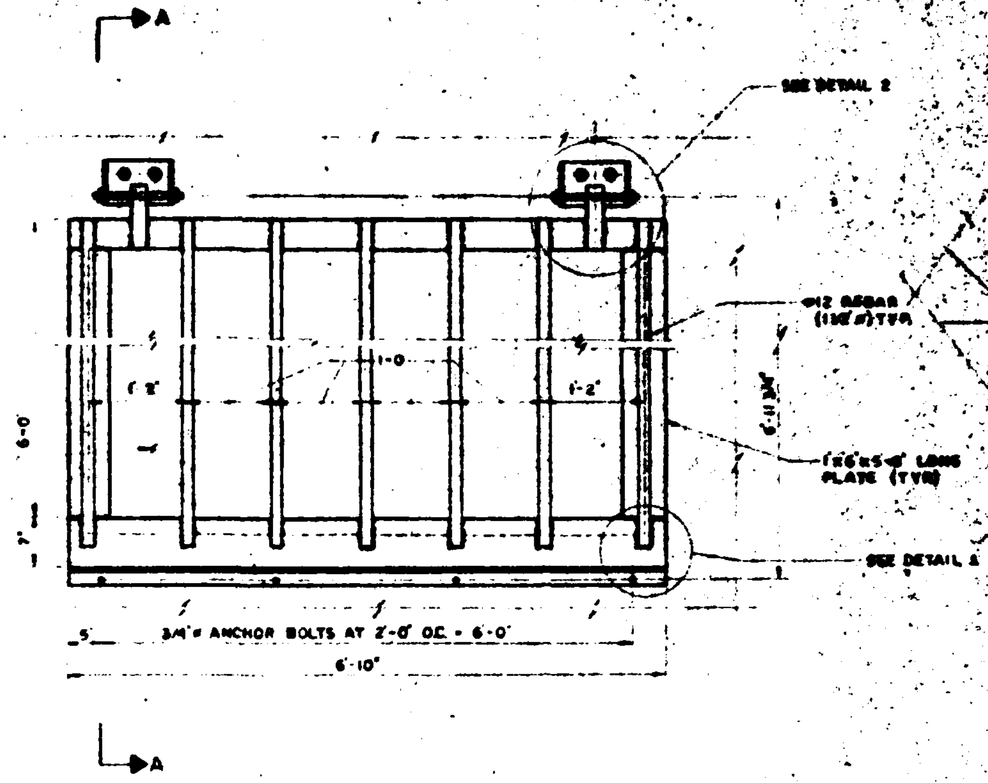
NOTES: 1. ELEVATIONS BASED ON U.S.G.S. DATUM

2. GATE VALVE ON EXISTING 24" DRAIN PRESENTLY NORMALLY OPEN. TO BE NORMALLY CLOSED AFTER COMPLETION OF TWIN CONDUITS

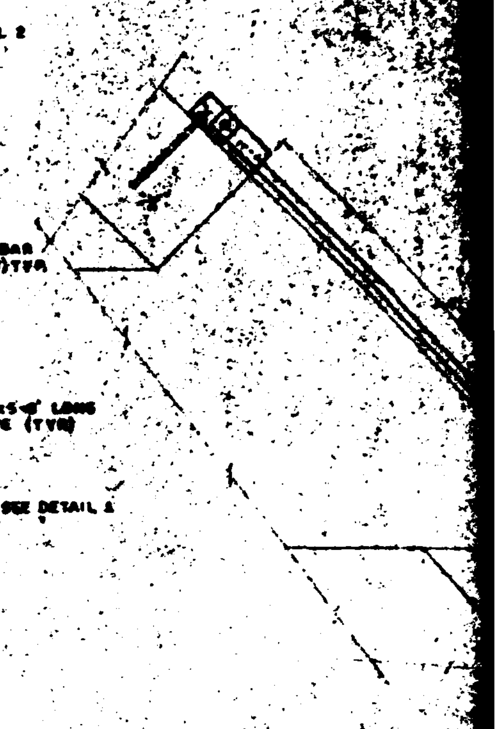
Plate 19

| | | | | |
|---|---|---|---|---|
| SAWYER | SCALE | COUNTY OF WESTCHESTER<br>DEPARTMENT OF PUBLIC WORKS<br>FRANK C. BOHLANDER | MODIFICATIONS OF WESTCHESTER JOINT WATER WORKS DAM<br>CONTRACT NO 2515 | DATE 1/6/78<br>SHEET 1 OF 4 |

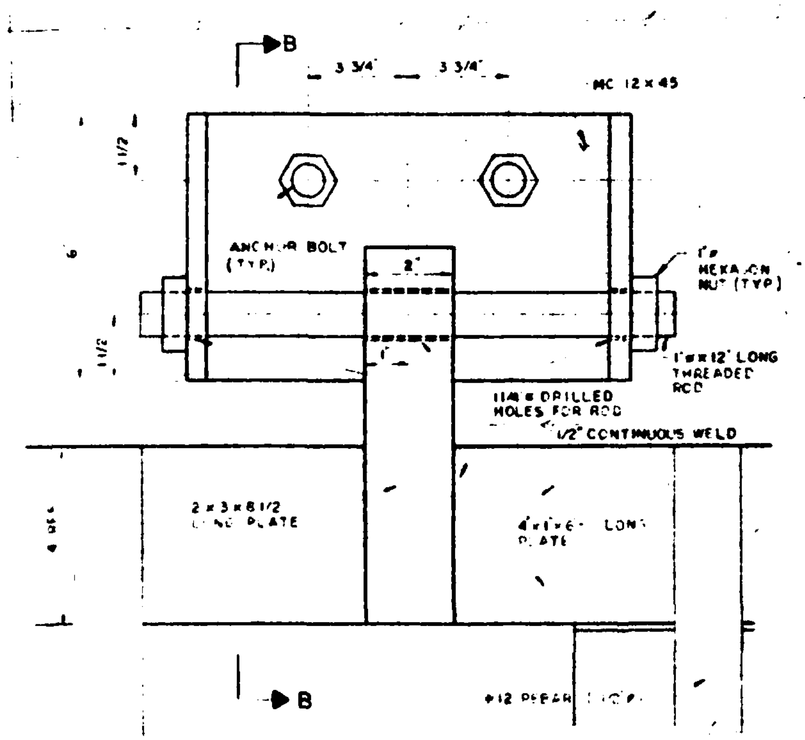
3'-0"x6'-4"
CONDUIT
SEE DWG
7721-1

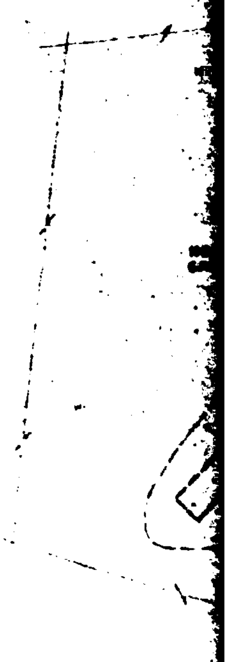



BARSCREEN ASSEMBLY
(1 REQUIRED PER CONDUIT)
SCALE: 1"=1'-0"



SECTION A-A
SCALE: 1"=1'-0"

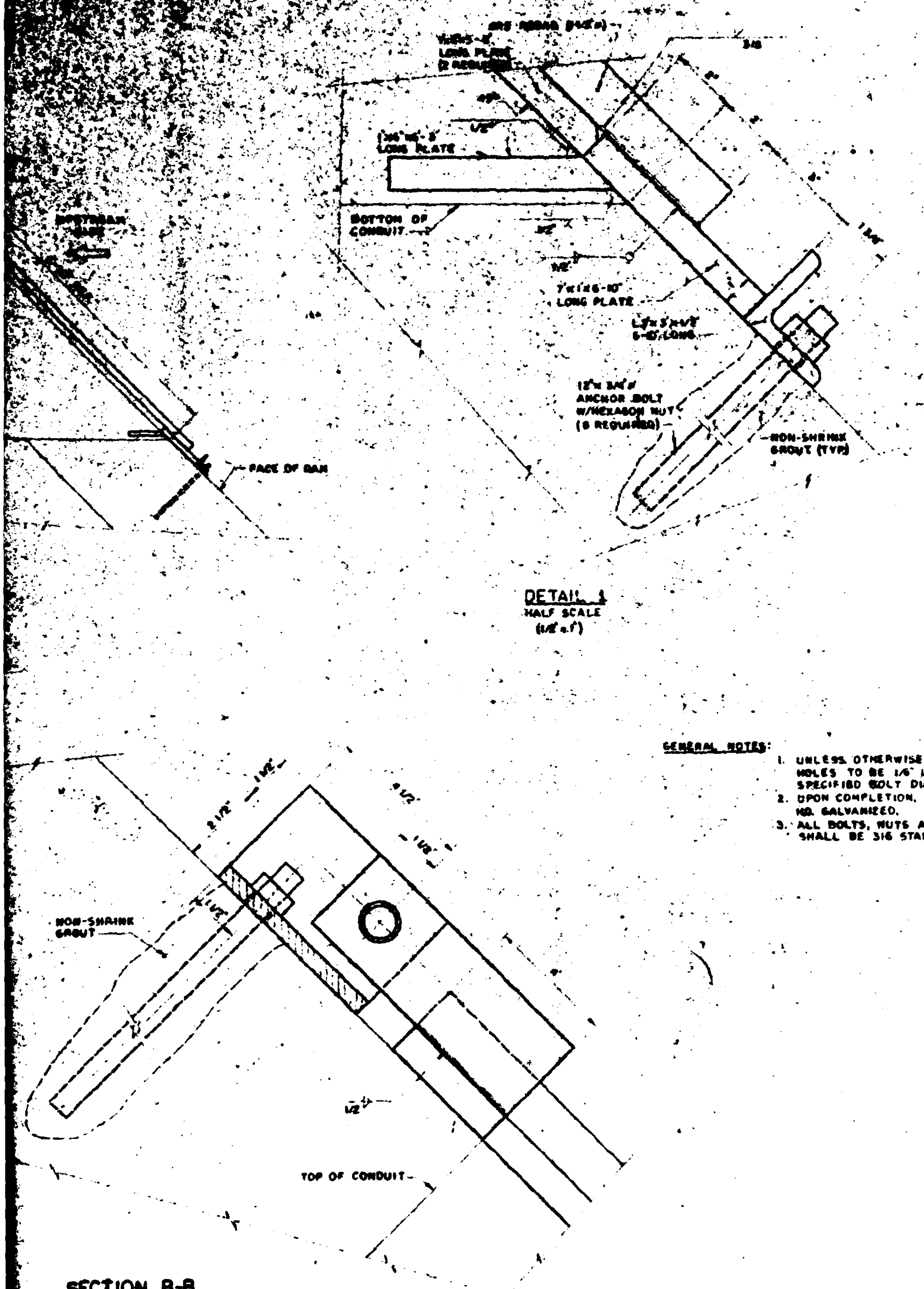


DETAIL 2
HALF SCALE
(1/2=1)

| | |
|---|---|
| DESIGNED | |
| DRAWN | |
| CHECKED | |
| SECT CHIEF | |
| PROJ ENGR | |

HAZEN AND SAW
ENGINEERS




DETAIL 1
HALF SCALE
(1/2" = 1')

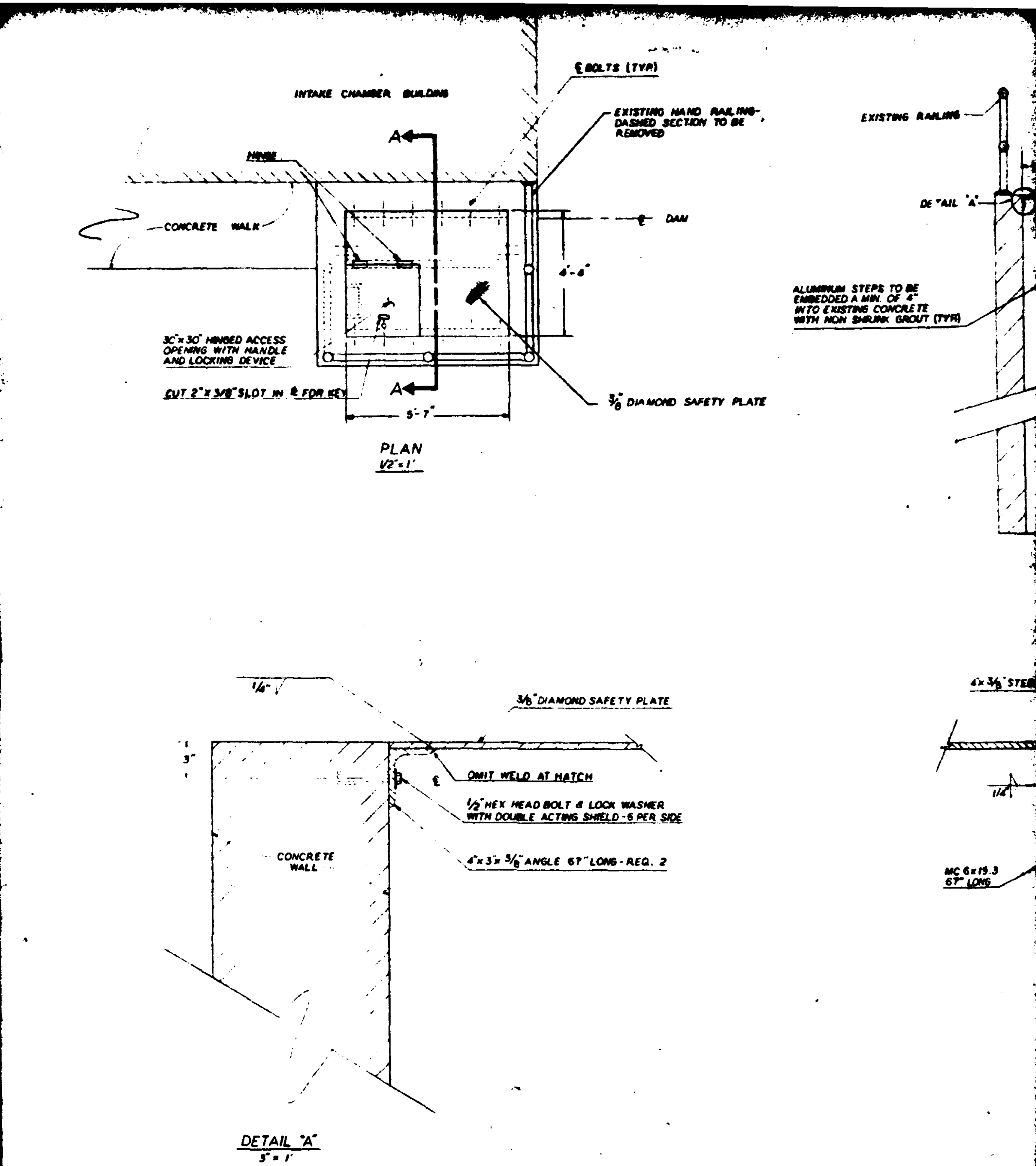
SECTION B-B
HALF SCALE
(1/2" = 1')

GENERAL NOTES:

1. UNLESS OTHERWISE SPECIFIED, DRILLED HOLES TO BE 1/6" LARGER THAN THE SPECIFIED BOLT DIAMETER.
2. UPON COMPLETION, ALL PARTS SHALL BE HD. GALVANIZED.
3. ALL BOLTS, NUTS AND ANCHOR BOLTS SHALL BE 316 STAINLESS STEEL.

Plate 12

| | | | | |
|---|---|---|---|---|
| SAWYER | SCALE | COUNTY OF WESTCHESTER<br>DEPARTMENT OF PUBLIC WORKS<br>FRANK C BONLANDER | MODIFICATIONS OF WESTCHESTER JOINT WATER WORKS DAM<br>CONTRACT NO. 2515<br>BARSCREEN DETAILS | DATE 1/6/78<br>SHEET 3 OF 4 |

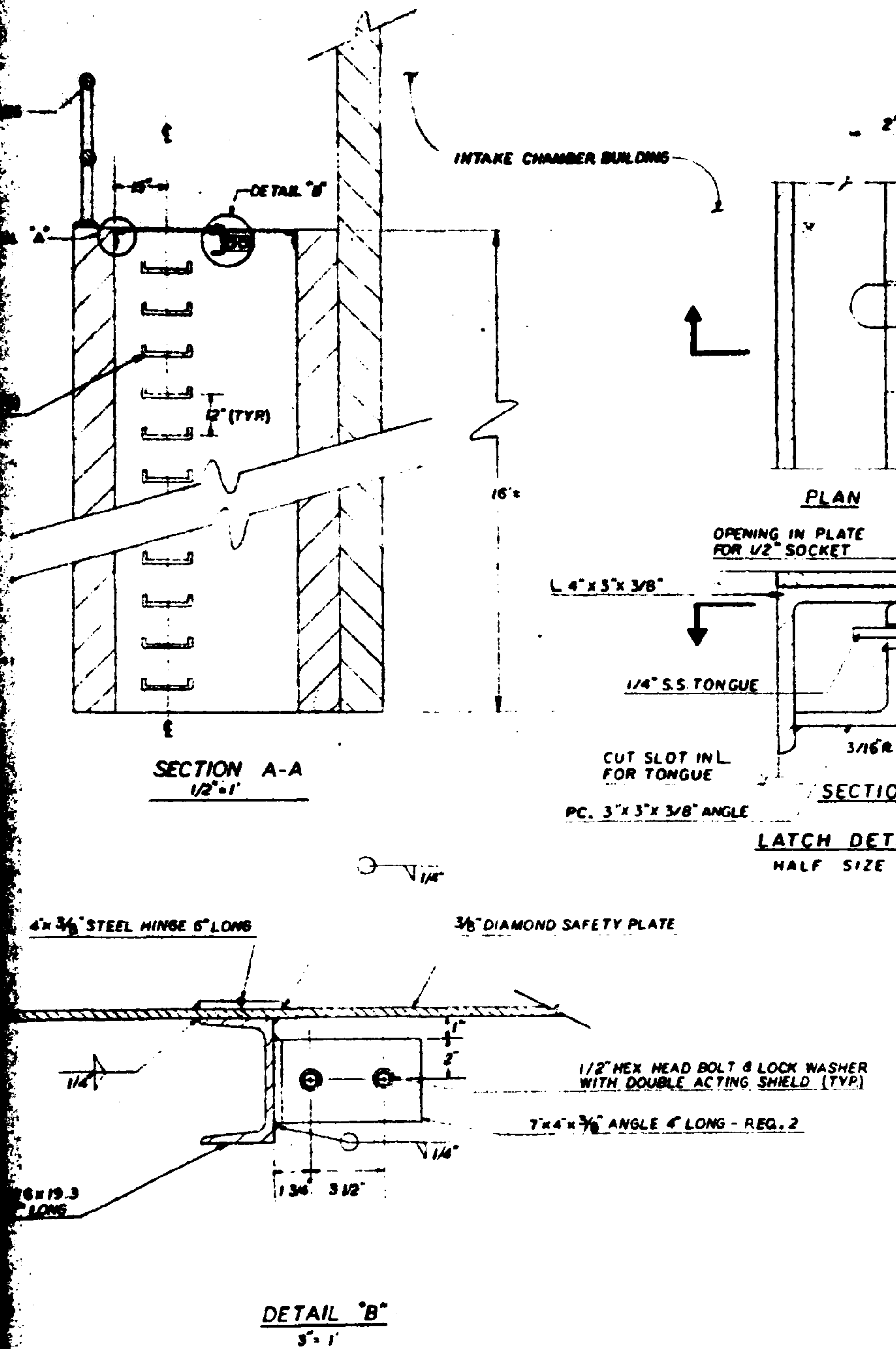



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1 | 12/8/77 | WEST. CO. D.P.W. REVIEW | T.W.T. | |
| NO. | DATE | ISSUED FOR | BY | NO. | DATE | ISSUED FOR | BY |

DESIGNED J.P.
DRAWN J.P.
CHECKED
SECT CHIEF
PROJ ENGR T.W.T.

P.E.
PARTNER

HAZEN AND SAW
ENGINEERS
360 LEXINGTON AVE
NEW YORK, NEW YORK




GENERAL NOTES

1. ALL EXPOSED STEEL EDGES TO BE CHAMFERED.
2. DIMENSIONS OF OPENING TO BE VERIFIED BY CONTRACTOR BEFORE FABRICATION.
3. UPON FABRICATION, ALL STEEL PARTS SHALL BE H.D. GALVANIZED, U. O. N.
4. ALL BOLTS, NUTS, AND ANCHOR BOLTS SHALL BE 316 STAINLESS STEEL.
5. EXISTING SPIRAL STAIRWAY TO BE REMOVED.

Plate 13

| | | | | |
|---|---|---|---|---|
| ...ND SAWYER ENGINEERS | SCALE AS NOTED | COUNTY OF WESTCHESTER DEPARTMENT OF PUBLIC WORKS — FRANK C. ROHLANDER | MODIFICATIONS OF WESTCHESTER JOINT WATER WORKS DAM CONTRACT NO. 2515 — HATCHWAY DETAILS | DATE 1/6/78 SHEET 4 OF 4 |

PHOTOGRAPHS

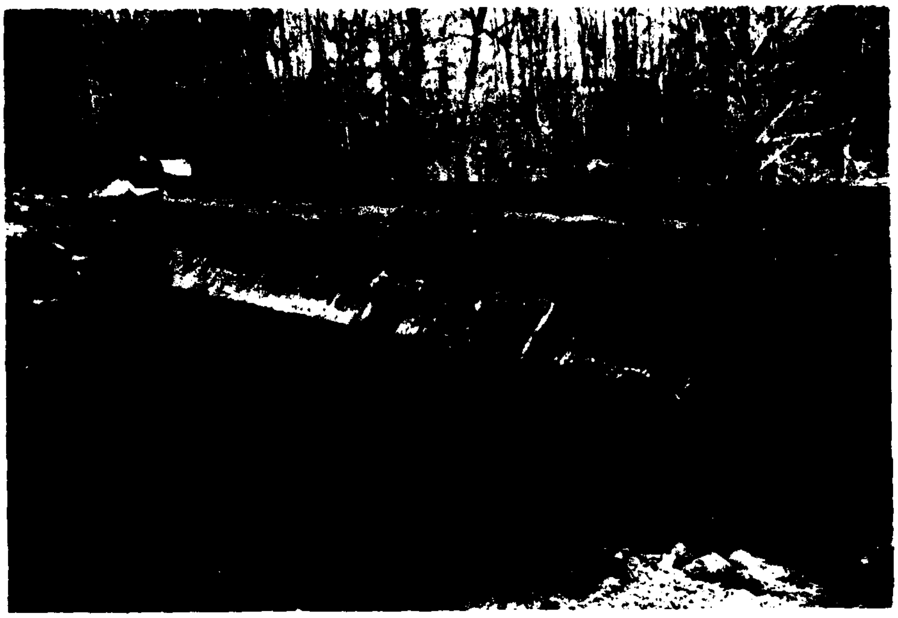
APPENDIX B

PHOTOGRAPH 1. CRACKED CONCRETE APRON AT EMBANKMENT CREST

PHOTOGRAPH 2. UPSTREAM VIEW OF EMBANKMENT

PHOTOGRAPH 3. GATE LIFTING MACHINERY LOCATED INSIDE GATEHOUSE (NO LONGER OPERATED)

PHOTOGRAPH 4. CONDITION OF REINFORCED CONCRETE SLAB (DOWNSTREAM FACE) AND CONCRETE ENCASING RESERVOIR DRAIN AT DISCHARGE POINT



PHOTOGRAPH 5. CONDITION OF CONCRETE SLAB (DOWNSTREAM FACE)

PHOTOGRAPH 6. CONDITION OF WATER PASSAGE CONDUITS

PHOTOGRAPH 7. CONDITION OF CONCRETE SIDEWALLS AND LOCATION OF SEEPAGE AT LEFT ABUTMENT

PHOTOGRAPH 8. GAP BETWEEN SILL AND FOUNDATION AT LEFT ABUTMENT OF BUTTRESS DAM

PHOTOGRAPH 9. VIEW OF DOWNSTREAM SLOPE OF EMBANKMENT

VISUAL INSPECTION CHECKLIST

APPENDIX C

## VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam Mamaroneck Reservoir Dam

Fed. I.D. # NY00111 DEC Dam No. Unknown

River Basin Mamaroneck River

Location: Town Mamaroneck County Westchester

Stream Name Mamaroneck River

Tributary of Unknown

Latitude (N) 40°-58.1' Longitude (W) 73°-44.4'

Type of Dam Ambursen (Buttress) with Earth Embankment

Hazard Category High

Date(s) of Inspection 02 April 81

Weather Conditions Sunny, 60°F

Reservoir Level at Time of Inspection 3inches above invert of conduit (E133)

b. Inspection Personnel Mr Anthony Dolcimascolo and Mr Al DiBernardo

c. Persons Contacted (Including Address & Phone No.)

Mr. Joe Morgan
Westchester Joint Waterworks
1625 Mamaroneck Ave
Mamaroneck, NY 10543

d. History:

Date Constructed 1928 Date(s) Reconstructed 1978

Designer Alexander Potter

Constructed By Unknown

Owner Town of Mamaroneck

2) Embankment

a. Characteristics

(1) Embankment Material Earth

(2) Cutoff Type Concrete Core Wall

(3) Impervious Core Not Applicable

(4) Internal Drainage System None

(5) Miscellaneous A concrete apron exists along the top of the embankment

b. Crest

(1) Vertical Alignment Good

(2) Horizontal Alignment Good

(3) Surface Cracks Some cracking in the concrete crest apron exists

(4) Miscellaneous None

c. Upstream Slope

(1) Slope (Estimate) (V:H) Approximately 1:2 (same as drawings)

(2) Undesirable Growth or Debris, Animal Burrows None

(3) Sloughing, Subsidence or Depressions None observed

(4) Slope Protection *Stone placed along upstream slope of embankment*

(5) Surface Cracks or Movement at Toe *There is no downstream slope to the dam; the d/s portion consists of nearly level fill material.*

d. Downstream Slope

(1) Slope (Estimate - V:H) *See (5) above (Gently sloping downstream slope)*

(2) Undesirable Growth or Debris, Animal Burrows *None*

(3) Sloughing, Subsidence or Depressions *Not Applicable*

(4) Surface Cracks or Movement at Toe *Not Applicable since there is actually no downstream toe of the embankment.*

(5) Seepage *Not Applicable*

(6) External Drainage System (Ditches, Trenches; Blanket) *Not Applicable*

(7) Condition Around Outlet Structure *Appears to be in good condition*

(8) Seepage Beyond Toe *Not Applicable*

e. Abutments - Embankment Contact

*At right embankment there exists a vertical concrete retaining wall for Mamaroneck Avenue The left contact is the buttress dam*

(1) Erosion at Contact None

(2) Seepage Along Contact None

3) Drainage System

a. Description of System None

b. Condition of System Not Applicable

c. Discharge from Drainage System Not Applicable

4) Instrumentation (Momumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.) None

5) Reservoir

a. Slopes The reservoir slope consist ~~of~~ low, very gently rolling hills. The slopes appear stable. The area is very developed.

b. Sedimentation There was no evidence of sedimentation problems in the reservoir area.

c. Unusual Conditions Which Affect Dam None

6) Area Downstream of Dam

a. Downstream Hazard (No. of Homes, Highways, etc.) Large number of homes and local roadways are located downstream

b. Seepage, Unusual Growth None observed. Area d/s of dam is a small housing development; wooded.

c. Evidence of Movement Beyond Toe of Dam None was observed

d. Condition of Downstream Channel Good with little to no debris. The channel is relatively deep. A small bridge exists about 1000' d/s of the dam

7) Spillway(s) (Including Discharge Conveyance Channel)

The overflow section is the Ambursen Dam. The Dam has been breached with two box culverts since its initial construction. The invert elevation of the water passageways is E133. The concrete decks (u/s & d/s) are supported by the concrete

a. General buttresses which are located 15 feet on center. Mamaroneck Dam is a run-of-the-river Ambursen dam, with an adjoining earth embankment. (See sheets 7 and 8 for description

b. Condition of Service Spillway See Sheets 7 and 8

c. Condition of Auxiliary Spillway *Not Applicable*

d. Condition of Discharge Conveyance Channel

*See (6) on Sheet (5)*

8) Reservoir Drain/Outlet

Type: Pipe ✓ Conduit ____ Other ____

Material: Concrete ____ Metal *Cast Iron or Steel* Other ____

Size: *24"ϕ* Length ____

Invert Elevations: Entrance *25 ft* Exit *≅ 25 ft (Horizontal Pipe)*

Physical Condition (Describe): Unobservable ✓

Material: *Unknown, although appears good at discharge location*

Joints: *Unobservable* Alignment *Unknown*

Structural Integrity: *Unknown*

Hydraulic Capability: *Water was flowing through the pipe at the time of this inspection*

Means of Control: Gate ____ Valve ✓ Uncontrolled ____

Operation: Operable ____ Inoperable ____ Other *Unknown*

Present Condition (Describe): *The gate valve appears as though it has not been maintained for some time*

9) Structural

a. Concrete Surfaces Concrete appears to be in good to excellent condition at the inner and outer concrete deck surfaces. The concrete haunches at the inner side of the upstream slab at each buttress The buttress concrete is in good condition as well as the water conduit concrete surfaces

b. Structural Cracking None was observed along the outer and inner deck surfaces, concrete haunch, culvert, sill or elsewhere along the dam.

c. Movement - Horizontal & Vertical Alignment (Settlement) No movement observed. The vertical and horizontal alignment of the crest appear good.

d. Junctions with Abutments or Embankments Appear to be good, except at left abutment where minor leakage through the foundation was observed

e. Drains - Foundation, Joint, Face None

f. Water Passages, Conduits, Sluices Two box culverts were constructed at invert El 33 at the approximate center of the dam circa 1978. These structures have metal bar grills to catch debris, etc, at their inlets

g. Seepage or Leakage Near the left abutment there appears to be some seepage through the foundation bedrock. The seepage could not be measured. No other seepage was observed in the vicinity of the dam

h. Joints - Construction, etc. Good Condition. There appears to be only little deterioration or spalling of concrete along horizontal and vertical construction lift lines

i. Foundation Bedrock comprised of massive and hard schist and is in good condition as observed at the left abutment. The rock does not appear to be erodable. Discontinuities were observed extending parallel and perpendicular to the dam

j. Abutments Left Abutment consist of sound rock as described above. The right abutment is the embankment previously described.

k. Control Gates The original plans show a sluice gate structure at the left abutment. Apparently this structure was never constructed.

l. Approach & Outlet Channels Not Applicable

m. Energy Dissipators (Plunge Pool, etc.) None

n. Intake Structures Gatehouse and valves are no longer operational. Were previously used to regulate the flow of water to a treatment plant that was located approx 200' d/s. Neither the plant nor the gatehouse (and control facilities) are operational

o. Stability The dam appears to be very stable.

p. Miscellaneous Flashboards exist along the top of the buttress dam. The flashboards appear to be in good condition. They are ≅ 2.5 high and consist of wooden planks supported by vertical metal posts

10) <u>Appurtenant Structures</u> (Powerhouse, Lock, Gatehouse, Other)

a. Description and Condition The gatehouse is located at the crest of the embankment adjacent to the overflow section. The gatehouse "houses" the gate machinery which was used to regulate flows to the downstream water treatment facilities. The gatehouse and facilities are no longer operational. The condition of the exterior concrete surfaces of the gatehouse is fair good. The gate operators are also in good condition

# HYDROLOGIC DATA AND COMPUTATIONS

APPENDIX D

# CHECK LIST FOR DAMS
# HYDROLOGIC AND HYDRAULIC
# ENGINEERING DATA

## AREA-CAPACITY DATA:

| | Elevation (ft.) | Surface Area (acres) | Storage Capacity (acre-ft.) |
|---|---|---|---|
| 1) Top of Dam | 44 | 49 ± | 320 |
| 2) Design High Water (Max. Design Pool) | Unknown | Unknown | Unknown |
| 3) Auxiliary Spillway Crest | Not Applicable | Not Applicable | Not Applicable |
| 4) Pool Level with Flashboards | 42.5 | 43 + | 240 (assumed) |
| 5) Service Spillway Crest | 40 | 33 | 107 |

## DISCHARGES

| | Volume (cfs) |
|---|---|
| 1) Average Daily | UNKNOWN |
| 2) Spillway @ Maximum High Water (TOP OF DAM) | 4240 |
| 3) Spillway @ Design High Water | Unknown |
| 4) Spillway @ Auxiliary Spillway Crest Elevation | Not Applicable |
| 5) Low Level Outlet w/ W.L. @ EL 44 | Unknown |
| 6) Total (of all facilities) @ Maximum High Water | 4800 |
| 7) Maximum Known Flood @ USGS Gage 9.26.75. | 3700 |
| 8) At Time of Inspection | UNKNOWN. |
| 9) Water Conduit Passages (Maximum Pool) | 560cfs |

**CREST:** **ELEVATION:** 40 (w/o flashboards

Type: Ambursen Dam with Earth Embankment

Width: —— Length: 180± feet

Spillover (Ambursen) Concrete Buttress Dam

Location Left-side of Project

**SPILLWAY:**

| SERVICE | | CONDUITS ~~AUXILIARY~~ |
|---|---|---|
| 40 | Elevation | EL 33 |
| | Type | Rectangular Openings |
| 130' | Width | 6+ feet |
| | **Type of Control** | |
| ✓ | Uncontrolled | ✓ |
| | Controlled: | |
| Not Applicable (NA) | Type (Flashboards; gate) | |
| (NA) | Number | |
| (NA) | Size/Length | |
| | Invert Material | |
| | Anticipated Length of operating service | |
| (NA) | Chute Length | |
| (NA) | Height Between Spillway Crest & Approach Channel Invert (Weir Flow) | |

HYDROMETEROLOGICAL GAGES:

Type : None

Location: Not Applicable (N.A.)

Records:

Date - N.A.

Max. Reading - N.A.

FLOOD WATER CONTROL SYSTEM:

Warning System: N.A

Method of Controlled Releases (mechanisms):

24" reservoir drain and gate valve

DRAINAGE AREA: 15.2 square miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Sub-urban development with woodlands & parks

Terrain - Relief: Gently sloping

Surface - Soil: Glacial Till and Fill

Runoff Potential (existing or planned extensive alterations to existing (surface or subsurface conditions)

unknown

Potential Sedimentation problem areas (natural or man-made; present or future)

Unknown

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

Unknown

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the Reservoir perimeter:

Location: Unknown

Elevation: Unknown

Reservoir:

Length @ Maximum Pool 0.1 (Miles)

Length of Shoreline (@ Spillway Crest) 2.5± (Miles)

# TAMS

Job No. 1579-03

Project MAMARONECK DAM INVESTIGATION

Subject HYDROLOGIC / HYDRAULIC COMPUTATION

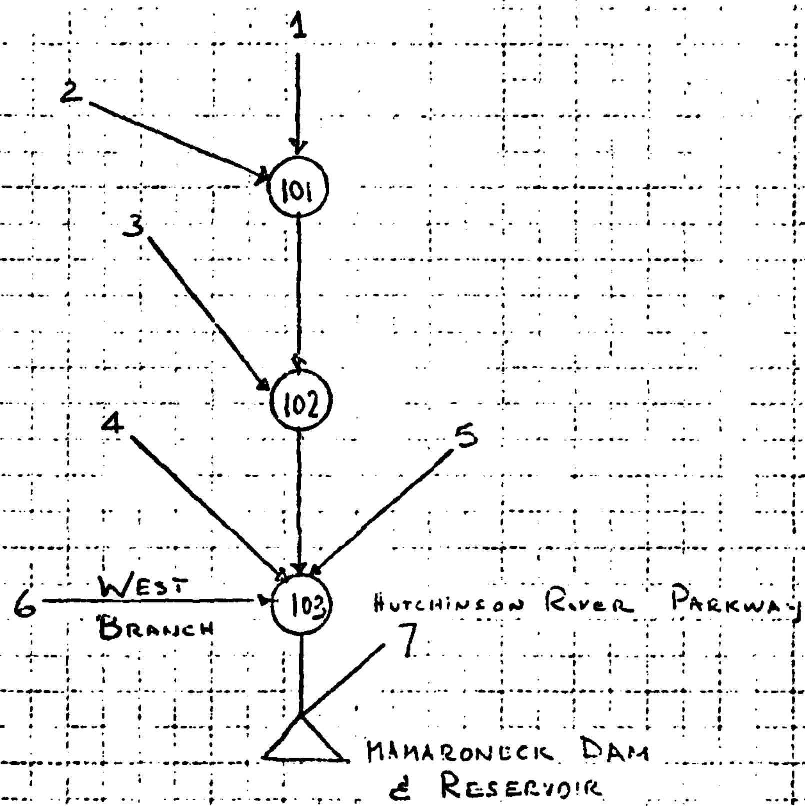
Sheet 1 of 57

Date APRIL 8, 81

By D.L.C

Ch'k. by

NODAL NETWORK



# TAMS

Job No. 1579-08 Sheet 2 of 57

Project MAMARONECK DAM PHASE 1 INSPECTION Date APRIL 8 1981

Subject HYDROLOGIC / HYDRAULIC COMPUTATIONS By D.L.C

Ch'k. by

FROM LOWER HUDSON RIVER BASIN HYDROLOGIC FLOOD ROUTING MODEL

| SUB-AREA | AREA | $C_p$ | $T_p$ |
|---|---|---|---|
| 1 | 2.89 | 0.63 | 3.4 |
| 2 | 2.50 | 0.61 | 2.7 |
| 3 | 2.33 | 0.64 | 4.7 |
| 4 | 1.62 | 0.63 | 3.0 |
| 5 | 1.36 | 0.63 | 2.0 |
| 6 | 2.77 | 0.89 | 3.6 |
| * 7 | 1.77 | 0.69 | 2.5 |
| Σ | 15.24 SQ.MI. | | |

FROM HYDROMET # 33

ALL SEASON 200 SQ MILE 24 HOUR PMP ~ 22.5"

| Duration | % of INDEX for Zone 6 (LAT 40°56') |
|---|---|
| 6 | 109 |
| 12 | 120 |
| 24 | 128 |
| 48 | 140 |

BASIN LOSSES INITIAL – 2.0 inch

CONSTANT – 0.1 in/hour

# TAMS

Job No. 1579 - 08
Sheet 3 of 57
Project MAMARONECK DAM INVESTIGATION
Date APRIL 8, 81
Subject HYDROLOGIC / HYDRAULIC COMPUTATIONS
By D.L.C.
Ch'k. by

LOW LEVEL OUTLETS.

AREA 2(6.3 x 3.0) = 2 x 18.9 = 37.8 sq ft

℄ EL 34.5 MSL.

FOR HEC 1 DB.

COQL = 0.6

CAREA = 37.8

EXPL = 0.5

ELEVL = 34.5

FLOW OVER DAM/SPILLWAY CREST (RUN OF RIVER DAM)

CREST LENGTH = 130.0'

| EL | H | C | Q |
|---|---|---|---|
| 40 | 0 | 0 | 0 |
| 41 | 1 | 3.45 | 450 |
| 42 | 2 | 3.82 | 1400 |
| 44 | 4 | 4.08 | 4240 |
| 46 | 6 | 4.13 | 7890 |
| 50 | 10 | 4.13 | 17000 |

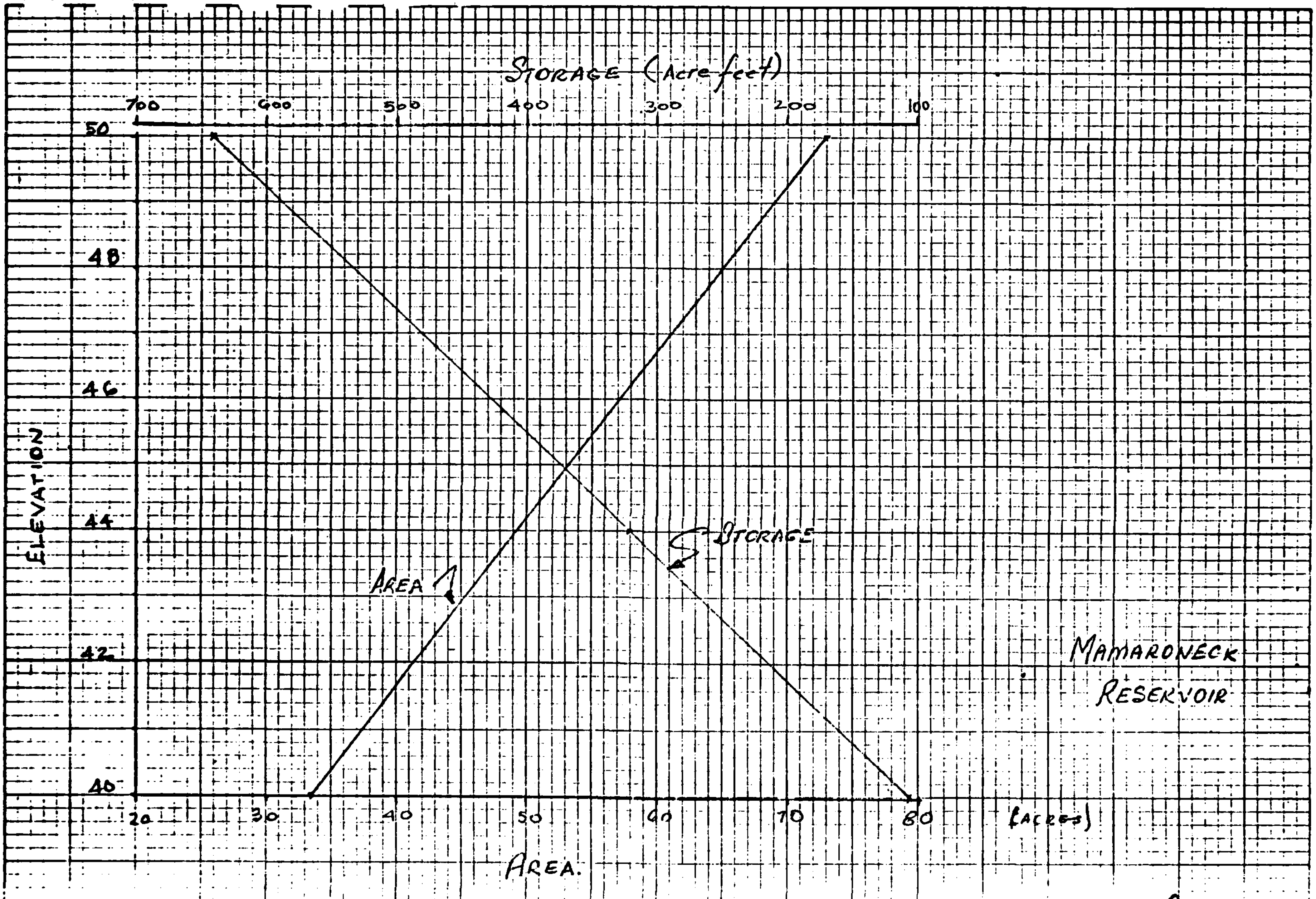
DAM OVERTOPPING TOP OF ABUTMENTS + FILL ON RIGHT BANK.

TOPEL = 44.0

CORD = 3.09

EXPD = 1.5

DAMWID = 35.0'


STORAGE (Acre feet)
700
600
500
400
300
200
100
50
48
46
44
42
40
ELEVATION
AREA
STORAGE
20
30
40
50
60
70
80
(ACRES)
AREA.
MAMARONECK
RESERVOIR

Sheet 4 of 57

# TAMS

Job No. 1579-08
Project MAMARONECK DAM INVESTIGATION
Subject HYDROLOGIC/HYDRAULIC COMPUTATIONS

Sheet 5 of 57
Date APRIL 8, '81
By D.L.C
Ch'k. by

LAKE AREA = 0.365 in² = 33.5 acres @ EL 40'

50' CONTOUR = 0.795 in² = 73 acres

| EL | ΔH | AREA | MEAN AREA | Δ VOL | STORAGE |
|---|---|---|---|---|---|
| 33 | | | | | |
| 40 | | 33.5 | | | 107 |
| | 10 | | 53.25 | 532.5 | |
| 50 | | 73.0 | | | 640 |

BOTTOM OF DAM EL 27    Slope = 3/800 = 0.0038

CROSS SECTION 800 FT Downstream of Dam (AT Bridge)

| | DISTANCE | ELEVATION |
|---|---|---|
| 1 | 0 | 50 |
| 2 | 220 | 40 |
| 3 | 360 | 30 |
| 4 | 365 | 24 |
| 5 | 415 | 24 |
| 6 | 420 | 30 |
| 7 | 600 | 40 |
| 8 | 750 | 50 |

PMF depth 14.8'

½ PMF depth 11.5'

```
*********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION       JULY 1978
  LAST MODIFICATION  01 APR 80
*********************************
   1           A1                           MAMARONECK DAM INVESTIGATION
   2           A2                           HEC-1DB PMF ANALYSIS
   3           A3                           APRIL 1981  TAMS  1579-OE
   4           B     100       6      30       0       0       0       0       0       0       0
   5           B1      5
   6           J       1       4       1
   7           J1      1     .75      .5     .25
   8           K       0       1                                       1
   9           K1      1 SUB-BASIN RUNOFF (1)
  10           M       1       1    2.89           15.24                                       1
  11           P            22.5     109     120     128     140
  12           T                                                       2     0.1                     .01
  13           W     3.4    0.63
  14           X     -.5    -.05     1.6
  15           K       0       1                                       1
  16           K1      2 SUB-BASIN (2) RUNOFF
  17           M       1       1    2.50           15.24                                       1
  18           P            22.5     109     120     128     140
  19           T                                                       1     0.1                     .01
  20           W     2.7    0.61
  21           X     -.5     .05     1.6
  22           K       2       1                                       1
  23           K1      3 COMBINE 2 HYDROGRAPHS AT NODE 101
  24           K       1       2                                       1
  25           K1      4 CHANNEL ROUTE TO NODE 102
  26           Y                                       1
  27           Y1      1                       2      .5
  28           K       0       2                                       1
  29           K1      5 SUB-BASIN (3) RUNOFF
  30           M       1       1    2.33           15.24                                       1
  31           P            22.5     109     120     128     140
  32           T                                                       2     0.1                     .02
  33           W     4.7    0.64
  34           X     -.5    -.05     1.6
  35           K       2       2                                       1
  36           K1      6 COMBINE 2 HYDROGRAPHS AT NODE 102
  37           K       1       3                                       1
  38           K1      7 CHANNEL ROUTE TO NODE 103
  39           Y                                       1
  40           Y1      1                       2     0.5
  41           K       0       3                                       1
  42           K1      8 SUB-BASIN (4) RUNOFF
  43           M       1       1    1.62           15.24                                       1
  44           P            22.5     109     120     128     140
  45           T                                                       2     0.1                     .02
  46           W       3    0.63
  47           X     -.5    -.05     1.6
  48           K       2       3
  49           K1      9 COMBINE 2 HYDROGRAPHS AT NODE 103
  50           K       0       3                                       1
```

Sheet 6 of 57

```
K1       10 SUB-BASIN (5) RUNOFF
M        1       1    1.36           15.24                                1
P             22.5     109     120     128     140
T                                                       2     0.1              .02
W        2    0.63
X      -.5    -.05     1.6
K        2       3                                      1
K1       11 COMBINE RUNOFF FROM 5 WITH 2 COMBINED HYDROGRAPHS
K        0       3                                      1
K1       12 WEST BRANCH RUNOFF
M        1       1    2.77           15.24                                1
P             22.5     109     120     128     140
T                                                       2      .1              .03
W      3.6    0.89
X      -.5    -.05     1.6
K        2       3                                      1
K1       13 COMBINE WEST BRANCH FLOW WITH UPPER BASIN FLOW
K        0       3                                      1
K1       14 INFLOW FROM AREA ADJACENT TO RESERVOIR
M        1       1    1.77           15.24                                1
P             22.5     109     120     128     140
T                                                       2      .1              .01
W      2.5    0.69
X      -.5    -.05     1.6
K        2       3                                      1
K1       15 COMBINE ADJACENT AREA FLOW WITH  RIVER FLOW AT RESERVOIR
K        1       4                                      1
K1       16 ROUTE THROUGH MAMARONECK RESERVOIR
Y                                1       1
Y1       1                                            107      -1
Y4      40      42      44      46      50
Y5       0     450    1400    4240    7890   17000
SA      85     107     640
SE      33      40      50
SS      40                            34.5     0.6    37.8     0.5
SD      44    3.09     1.5      35
K        1      17                                      1
K1       17 CHANNEL ROUTE AT STATION 8+00 (ROAD CROSSING)
Y                                1       1
Y1       1
Y6    .035    .035    .035      24      50     800  0.0038
Y7       0      50     220      40     360      30     365      24     415      24
Y7     420      30     600      40     750      50
K       99
```

Sheet 7 of 57

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

```
RUNOFF HYDROGRAPH AT              1
RUNOFF HYDROGRAPH AT              1
COMBINE  2 HYDROGRAPHS AT         1
ROUTE HYDROGRAPH TO               2
RUNOFF HYDROGRAPH AT              2
COMBINE  2 HYDROGRAPHS AT         2
ROUTE HYDROGRAPH TO               3
RUNOFF HYDROGRAPH AT              3
COMBINE  2 HYDROGRAPHS AT         3
RUNOFF HYDROGRAPH AT              3
COMBINE  2 HYDROGRAPHS AT         3
RUNOFF HYDROGRAPH AT              3
COMBINE  2 HYDROGRAPHS AT         3
RUNOFF HYDROGRAPH AT              3
COMBINE  2 HYDROGRAPHS AT         3
ROUTE HYDROGRAPH TO               4
ROUTE HYDROGRAPH TO              17
END OF NETWORK
```

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```
********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
LAST MODIFICATION  21 APR 80
********************************

RUN DATE  81/05/03.
    TIME  13.26.41.

                    MAMARONECK DAM INVESTIGATION
                    HEC-1DB PMF ANALYSIS
                    APRIL 1981  TAMS  1579-08

                           JOB SPECIFICATION
     NQ    NHR   NMIN   IDAY    IHR   IMIN  METRC   IPLT   IPRT  NSTAN
    100      0     30      0      0      0      0      0      0      0
                         JOPER    NWT  LROPT  TRACE
                             5      0      0      0

                    MULTI-PLAN ANALYSES TO BE PERFORMED
                       NPLAN= 1 NRTIO= 4 LRTIO= 1
     RTIOS=   1.00    .75    .50    .25

  *********       *********       *********       *********       *********

                    SUB-AREA RUNOFF COMPUTATION

     1 SUB-BASIN RUNOFF (1)

            ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                1       0       0       0       0       0       1       0       0

                              HYDROGRAPH DATA
     IHYDG   IUHG   TAREA   SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
         1      1    2.69   0.00   15.24    0.00   0.000       0       1       0

                              PRECIP DATA
            SPFE     PMS      R6     R12     R24     R48     R72     R96
            0.00   22.50  109.00  120.00  128.00  140.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS  .814

                              LOSS DATA
     LROPT  STRKR  DLTKR  RTIOL  ERAIN  STRKS  RTIOK  STRTL  CNSTL  ALSMX  RTIMP
         0   0.00   0.00   1.00   0.00   0.00   1.00   2.00    .10   0.00    .01

                         UNIT HYDROGRAPH DATA
                       TP=  3.40    CP= .63    NTA=  0

                              RECESSION DATA
                 STRTQ=    -.50   QRCSN=   -.05   RTIOR= 1.60
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 7.75 AND R= 6.17 INTERVALS

     UNIT HYDROGRAPH 37 END-OF-PERIOD ORDINATES, LAG=  3.43 HOURS, CP=  .64  VOL= 1.00
      12.      67.     134.     208.     279.     327.     349.     340.     301.     256.
     217.     185.     157.     134.     114.      97.      82.      70.      59.      50.
```

Sheet 9 of 57

43. 36. 31. 26. 22. 19. 16. 14. 12. 10.
8. 7. 5. 5. 4. 4. 3.

0

| MO.DA | HR.MN | PERIOD | RAIN | EXCS | LOSS | END-OF-PERIOD FLOW COMP Q | MO.DA | HR.MN | PERIOD | RAIN | EXCS | LOSS | COMP Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.01 | .30 | 1 | .00 | .00 | .00 | 1. | 1.02 | 1.30 | 51 | .05 | .00 | .05 | 7. |
| 1.01 | 1.00 | 2 | .00 | .00 | .00 | 1. | 1.02 | 2.00 | 52 | .05 | .00 | .05 | 6. |
| 1.01 | 1.30 | 3 | .00 | .00 | .00 | 1. | 1.02 | 2.30 | 53 | .05 | .00 | .05 | 5. |
| 1.01 | 2.00 | 4 | .00 | .00 | .00 | 1. | 1.02 | 3.00 | 54 | .05 | .00 | .05 | 5. |
| 1.01 | 2.30 | 5 | .00 | .00 | .00 | 1. | 1.02 | 3.30 | 55 | .05 | .00 | .05 | 4. |
| 1.01 | 3.00 | 6 | .00 | .00 | .00 | 1. | 1.02 | 4.00 | 56 | .05 | .00 | .05 | 4. |
| 1.01 | 3.30 | 7 | .00 | .00 | .00 | 1. | 1.02 | 4.30 | 57 | .05 | .00 | .05 | 4. |
| 1.01 | 4.00 | 8 | .00 | .00 | .00 | 1. | 1.02 | 5.00 | 58 | .05 | .00 | .05 | 3. |
| 1.01 | 4.30 | 9 | .00 | .00 | .00 | 1. | 1.02 | 5.30 | 59 | .05 | .00 | .05 | 3. |
| 1.01 | 5.00 | 10 | .00 | .00 | .00 | 1. | 1.02 | 6.00 | 60 | .05 | .00 | .05 | 3. |
| 1.01 | 5.30 | 11 | .00 | .00 | .00 | 1. | 1.02 | 6.30 | 61 | .17 | .12 | .05 | 5. |
| 1.01 | 6.00 | 12 | .00 | .00 | .00 | 1. | 1.02 | 7.00 | 62 | .17 | .12 | .05 | 13. |
| 1.01 | 6.30 | 13 | .02 | .00 | .02 | 1. | 1.02 | 7.30 | 63 | .17 | .12 | .05 | 28. |
| 1.01 | 7.00 | 14 | .02 | .00 | .02 | 1. | 1.02 | 8.00 | 64 | .17 | .12 | .05 | 53. |
| 1.01 | 7.30 | 15 | .02 | .00 | .02 | 1. | 1.02 | 8.30 | 65 | .17 | .12 | .05 | 86. |
| 1.01 | 8.00 | 16 | .02 | .00 | .02 | 1. | 1.02 | 9.00 | 66 | .17 | .12 | .05 | 124. |
| 1.01 | 8.30 | 17 | .02 | .00 | .02 | 1. | 1.02 | 9.30 | 67 | .17 | .12 | .05 | 165. |
| 1.01 | 9.00 | 18 | .02 | .00 | .02 | 1. | 1.02 | 10.00 | 68 | .17 | .12 | .05 | 205. |
| 1.01 | 9.30 | 19 | .02 | .00 | .02 | 1. | 1.02 | 10.30 | 69 | .17 | .12 | .05 | 241. |
| 1.01 | 10.00 | 20 | .02 | .00 | .02 | 1. | 1.02 | 11.00 | 70 | .17 | .12 | .05 | 271. |
| 1.01 | 10.30 | 21 | .02 | .00 | .02 | 1. | 1.02 | 11.30 | 71 | .17 | .12 | .05 | 296. |
| 1.01 | 11.00 | 22 | .02 | .00 | .02 | 1. | 1.02 | 12.00 | 72 | .17 | .12 | .05 | 318. |
| 1.01 | 11.30 | 23 | .02 | .00 | .02 | 1. | 1.02 | 12.30 | 73 | 1.00 | .95 | .05 | 352. |
| 1.01 | 12.00 | 24 | .02 | .00 | .02 | 1. | 1.02 | 13.00 | 74 | 1.00 | .95 | .05 | 423. |
| 1.01 | 12.30 | 25 | .09 | .00 | .09 | 1. | 1.02 | 13.30 | 75 | 1.20 | 1.15 | .05 | 552. |
| 1.01 | 13.00 | 26 | .09 | .00 | .09 | 1. | 1.02 | 14.00 | 76 | 1.20 | 1.15 | .05 | 749. |
| 1.01 | 13.30 | 27 | .11 | .00 | .11 | 1. | 1.02 | 14.30 | 77 | 1.50 | 1.45 | .05 | 1022. |
| 1.01 | 14.00 | 28 | .11 | .00 | .11 | 1. | 1.02 | 15.00 | 78 | 1.50 | 1.45 | .05 | 1363. |
| 1.01 | 14.30 | 29 | .14 | .00 | .14 | 1. | 1.02 | 15.30 | 79 | 1.82 | 1.77 | .05 | 1762. |
| 1.01 | 15.00 | 30 | .14 | .00 | .14 | 2. | 1.02 | 16.00 | 80 | 5.77 | 5.72 | .05 | 2271. |
| 1.01 | 15.30 | 31 | .17 | .00 | .17 | 2. | 1.02 | 16.30 | 81 | 1.40 | 1.35 | .05 | 2908. |
| 1.01 | 16.00 | 32 | .54 | .01 | .54 | 3. | 1.02 | 17.00 | 82 | 1.40 | 1.35 | .05 | 3593. |
| 1.01 | 16.30 | 33 | .13 | .00 | .13 | 3. | 1.02 | 17.30 | 83 | 1.10 | 1.05 | .05 | 4263. |
| 1.01 | 17.00 | 34 | .13 | .00 | .13 | 4. | 1.02 | 18.00 | 84 | 1.10 | 1.05 | .05 | 4844. |
| 1.01 | 17.30 | 35 | .10 | .01 | .10 | 5. | 1.02 | 18.30 | 85 | .07 | .02 | .05 | 5240. |
| 1.01 | 18.00 | 36 | .10 | .05 | .05 | 6. | 1.02 | 19.00 | 86 | .07 | .02 | .05 | 5397. |
| 1.01 | 18.30 | 37 | .01 | .00 | .01 | 10. | 1.02 | 19.30 | 87 | .07 | .02 | .05 | 5281. |
| 1.01 | 19.00 | 38 | .01 | .00 | .01 | 14. | 1.02 | 20.00 | 88 | .07 | .02 | .05 | 4920. |
| 1.01 | 19.30 | 39 | .01 | .00 | .01 | 18. | 1.02 | 20.30 | 89 | .07 | .02 | .05 | 4434. |
| 1.01 | 20.00 | 40 | .01 | .00 | .01 | 22. | 1.02 | 21.00 | 90 | .07 | .02 | .05 | 3916. |
| 1.01 | 20.30 | 41 | .01 | .00 | .01 | 24. | 1.02 | 21.30 | 91 | .07 | .02 | .05 | 3399. |
| 1.01 | 21.00 | 42 | .01 | .00 | .01 | 25. | 1.02 | 22.00 | 92 | .07 | .02 | .05 | 2915. |
| 1.01 | 21.30 | 43 | .01 | .00 | .01 | 23. | 1.02 | 22.30 | 93 | .07 | .02 | .05 | 2491. |
| 1.01 | 22.00 | 44 | .01 | .00 | .01 | 21. | 1.02 | 23.00 | 94 | .07 | .02 | .05 | 2131. |
| 1.01 | 22.30 | 45 | .01 | .00 | .01 | 19. | 1.02 | 23.30 | 95 | .07 | .02 | .05 | 1625. |
| 1.01 | 23.00 | 46 | .01 | .00 | .01 | 15. | 1.03 | 0.00 | 96 | .07 | .02 | .05 | 1564. |
| 1.01 | 23.30 | 47 | .01 | .00 | .01 | 13. | 1.03 | .30 | 97 | 0.00 | 0.00 | 0.00 | 1343. |
| 1.02 | 0.00 | 48 | .01 | .00 | .01 | 11. | 1.03 | 1.00 | 98 | 0.00 | 0.00 | 0.00 | 1153. |
| 1.02 | .30 | 49 | .05 | .00 | .05 | 9. | 1.03 | 1.30 | 99 | 0.00 | 0.00 | 0.00 | 989. |
| 1.02 | 1.00 | 50 | .05 | .00 | .05 | 8. | 1.03 | 2.00 | 100 | 0.00 | 0.00 | 0.00 | 845. |
| | | | | | | | | | SUM | 25.65 | 21.17 | 4.49 | 74052. |
| | | | | | | | | | | ( 652.) | ( 538.) | ( 114.) | ( 2097.77) |

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| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 5397. | 4242. | 1528. | 737. | 73656. |
| CMS | 153. | 120. | 43. | 21. | 2086. |
| INCHES | | 13.65 | 19.68 | 19.76 | 19.76 |
| MM | | 346.79 | 499.82 | 501.83 | 501.83 |
| AC-FT | | 2103. | 3031. | 3044. | 3044. |
| THOUS CU M | | 2594. | 3739. | 3754. | 3754. |

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. |
| 2. | 3. | 3. | 4. | 5. | 6. | 10. | 14. | 18. | 22. |
| 24. | 25. | 23. | 21. | 18. | 15. | 13. | 11. | 9. | 8. |
| 7. | 6. | 5. | 5. | 4. | 4. | 4. | 3. | 3. | 3. |
| 5. | 13. | 23. | 53. | 86. | 124. | 165. | 205. | 241. | 271. |
| 296. | 318. | 352. | 423. | 552. | 749. | 1022. | 1363. | 1762. | 2271. |
| [illegible] | 3593. | 4263. | 4844. | 5240. | 5397. | 5281. | 4920. | 4434. | 3916. |
| 3399. | 2915. | 2491. | 2131. | 1825. | 1564. | 1343. | 1153. | 989. | 848. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 5397. | 4242. | 1528. | 737. | 73656. |
| CMS | 153. | 120. | 43. | 21. | 2086. |
| INCHES | | 13.65 | 19.68 | 19.76 | 19.76 |
| MM | | 346.79 | 499.82 | 501.83 | 501.83 |
| AC-FT | | 2103. | 3031. | 3044. | 3044. |
| THOUS CU M | | 2594. | 3739. | 3754. | 3754. |

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 2. | 2. | 2. | 3. | 3. | 5. | 7. | 10. | 14. | 16. |
| 18. | 17. | [illegible] | 15. | 13. | 11. | 10. | 8. | 7. | 6. |
| 5. | 5. | 4. | 4. | 3. | 3. | 3. | 3. | 2. | 2. |
| 4. | 10. | 21. | 40. | 64. | 93. | 124. | 154. | 180. | 203. |
| 222. | 239. | 264. | 317. | 414. | 562. | 766. | 1022. | 1321. | 1704. |
| 2181. | 2694. | 3197. | 3633. | 3930. | 4048. | 3961. | 3690. | 3326. | 2937. |
| 2549. | 2186. | 1868. | 1593. | 1368. | 1173. | 1007. | 864. | 742. | 636. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 4048. | 3131. | 1146. | 552. | 55242. |
| CMS | 115. | 90. | 32. | 16. | 1564. |
| INCHES | | 10.24 | 14.76 | 14.82 | 14.82 |
| MM | | 260.09 | 374.87 | 376.37 | 376.37 |
| AC-FT | | 1577. | 2274. | 2283. | 2283. |
| THOUS CU M | | 1946. | 2804. | 2816. | 2816. |

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 1. | 1. | 1. | 1. |
| 1. | 1. | 2. | 2. | 2. | 3. | 5. | 7. | 9. | 11. |
| 12. | 12. | 12. | 10. | 9. | 7. | 6. | 5. | 5. | 4. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3. | 3. | 3. | 2. | 2. | 2. | 2. | 2. | 2. | 1. |
| 2. | 6. | 14. | 26. | 43. | 62. | 83. | 103. | 120. | 135. |
| 148. | 159. | 176. | 212. | 276. | 375. | 511. | 682. | 881. | 1136. |
| 1454. | 1796. | 2131. | 2422. | 2620. | 2699. | 2641. | 2460. | 2217. | 1958. |
| 1699. | 1457. | 1246. | 1065. | 912. | 752. | 671. | 576. | 495. | 424. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 2699. | 2121. | 764. | 368. | 36828. |
| CMS | 76. | 60. | 22. | 10. | 1043. |
| INCHES | | 6.83 | 9.84 | 9.88 | 9.88 |
| MM | | 173.40 | 249.91 | 250.91 | 250.91 |
| AC-FT | | 1052. | 1516. | 1522. | 1522. |
| THOUS CU M | | 1297. | 1870. | 1877. | 1877. |

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 1. | 1. | 1. | 1. | 1. | 2. | 2. | 3. | 5. | 5. |
| 6. | 6. | 5. | 5. | 4. | 4. | 3. | 3. | 2. | 2. |
| 2. | 2. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 3. | 7. | 13. | 21. | 31. | 41. | 51. | 60. | 68. |
| 74. | 80. | 83. | 106. | 138. | 187. | 255. | 341. | 440. | 558. |
| 727. | 898. | 1065. | 1211. | 1310. | 1349. | 1320. | 1230. | 1109. | 979. |
| 850. | 729. | 623. | 533. | 456. | 391. | 336. | 288. | 247. | 212. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 1349. | 1060. | 382. | 194. | 18414. |
| CMS | 38. | 30. | 11. | 5. | 521. |
| INCHES | | 3.41 | 4.92 | 4.94 | 4.94 |
| MM | | 86.70 | 124.96 | 125.46 | 125.46 |
| AC-FT | | 526. | 755. | 761. | 761. |
| THOUS CU M | | 649. | 935. | 939. | 939. |

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

2 SUB-BASIN (2) RUNOFF

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

HYDROGRAPH DATA

| IHYDG | IUHG | TAREA | SNAP | TRSDA | TRSPC | RATIO | ISNOW | ISAME | LOCAL |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 2.50 | 0.00 | 15.24 | 0.00 | 0.000 | 0 | 1 | 0 |

PRECIP DATA

| SPFE | PMS | R6 | R12 | R24 | R48 | R72 | R96 |
|---|---|---|---|---|---|---|---|
| 0.00 | 22.50 | 109.00 | 120.00 | 129.00 | 140.00 | 0.00 | 0.00 |

TRSPC COMPUTED BY THE PROGRAM IS .814

LOSS DATA

LROPT STRKR DLTKR RTIOL ERAIN STRKS RTIOK STRTL CNSTL ALSMX RTIMP

Sheet 12 of 57

0 0.00 0.40 1.00 0.00 0.00 1.00 1.00 .10 0.00 .01

UNIT HYDROGRAPH DATA
TP= 2.70 CP= .61 NTA= 0

RECESSION DATA
STRTQ= -.50 QRCSN= .05 RTIOR= 1.60

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.22 AND R= 5.24 INTERVALS

UNIT HYDROGRAPH 32 END-OF-PERIOD ORDINATES, LAG= 2.69 HOURS, CP= .61 VOL= 1.00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 26. | 94. | 185. | 277. | 342. | 364. | 335. | 279. | 231. | 190. |
| 157. | 130. | 107. | 89. | 73. | 60. | 50. | 41. | 34. | 28. |
| 23. | 19. | 15. | 13. | 11. | 9. | 7. | 6. | 5. | 4. |
| 3. | 3. | | | | | | | | |

END-OF-PERIOD FLOW

| MO.DA | HR.MN | PERIOD | RAIN | EXCS | LOSS | COMP Q | MO.DA | HR.MN | PERIOD | RAIN | EXCS | LOSS | COMP Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.01 | .30 | 1 | .00 | .00 | .00 | 1. | 1.02 | 1.30 | 51 | .05 | .00 | .05 | 28. |
| 1.01 | 1.00 | 2 | .00 | .00 | .00 | 1. | 1.02 | 2.00 | 52 | .05 | .00 | .05 | 23. |
| 1.01 | 1.30 | 3 | .00 | .00 | .00 | 1. | 1.02 | 2.30 | 53 | .05 | .00 | .05 | 20. |
| 1.01 | 2.00 | 4 | .00 | .00 | .00 | 1. | 1.02 | 3.00 | 54 | .05 | .00 | .05 | 16. |
| 1.01 | 2.30 | 5 | .00 | .00 | .00 | 1. | 1.02 | 3.30 | 55 | .05 | .00 | .05 | 14. |
| 1.01 | 3.00 | 6 | .00 | .00 | .00 | 1. | 1.02 | 4.00 | 56 | .05 | .00 | .05 | 12. |
| 1.01 | 3.30 | 7 | .00 | .00 | .00 | 1. | 1.02 | 4.30 | 57 | .05 | .00 | .05 | 10. |
| 1.01 | 4.00 | 8 | .00 | .00 | .00 | 1. | 1.02 | 5.00 | 58 | .05 | .00 | .05 | 9. |
| 1.01 | 4.30 | 9 | .00 | .00 | .00 | 1. | 1.02 | 5.30 | 59 | .05 | .00 | .05 | 7. |
| 1.01 | 5.00 | 10 | .00 | .00 | .00 | 1. | 1.02 | 6.00 | 60 | .05 | .00 | .05 | 6. |
| 1.01 | 5.30 | 11 | .00 | .00 | .00 | 1. | 1.02 | 6.30 | 61 | .17 | .12 | .05 | 9. |
| 1.01 | 6.00 | 12 | .00 | .00 | .00 | 1. | 1.02 | 7.00 | 62 | .17 | .12 | .05 | 19. |
| 1.01 | 6.30 | 13 | .02 | .00 | .02 | 1. | 1.02 | 7.30 | 63 | .17 | .12 | .05 | 40. |
| 1.01 | 7.00 | 14 | .02 | .00 | .02 | | 1.02 | 8.00 | 64 | .17 | .12 | .05 | 71. |
| 1.01 | 7.30 | 15 | .02 | .00 | .02 | 1. | 1.02 | 8.30 | 65 | .17 | .12 | .05 | 111. |
| 1.01 | 8.00 | 16 | .02 | .00 | .02 | 1. | 1.02 | 9.00 | 66 | .17 | .12 | .05 | 154. |
| 1.01 | 8.30 | 17 | .02 | .00 | .02 | 1. | 1.02 | 9.30 | 67 | .17 | .12 | .05 | 193. |
| 1.01 | 9.00 | 18 | .02 | .00 | .02 | 1. | 1.02 | 10.00 | 68 | .17 | .12 | .05 | 226. |
| 1.01 | 9.30 | 19 | .02 | .00 | .02 | 1. | 1.02 | 10.30 | 69 | .17 | .12 | .05 | 253. |
| 1.01 | 10.00 | 20 | .02 | .00 | .02 | 1. | 1.02 | 11.00 | 70 | .17 | .12 | .05 | 276. |
| 1.01 | 10.30 | 21 | .02 | .00 | .02 | 1. | 1.02 | 11.30 | 71 | .17 | .12 | .05 | 294. |
| 1.01 | 11.00 | 22 | .02 | .00 | .02 | 1. | 1.02 | 12.00 | 72 | .17 | .12 | .05 | 310. |
| 1.01 | 11.30 | 23 | .02 | .00 | .02 | 1. | 1.02 | 12.30 | 73 | 1.00 | .95 | .05 | 343. |
| 1.01 | 12.00 | 24 | .02 | .00 | .02 | 1. | 1.02 | 13.00 | 74 | 1.00 | .95 | .05 | 432. |
| 1.01 | 12.30 | 25 | .09 | .00 | .09 | 1. | 1.02 | 13.30 | 75 | 1.20 | 1.15 | .05 | 599. |
| 1.01 | 13.00 | 26 | .09 | .00 | .09 | 1. | 1.02 | 14.00 | 76 | 1.20 | 1.15 | .05 | 855. |
| 1.01 | 13.30 | 27 | .11 | .00 | .11 | 1. | 1.02 | 14.30 | 77 | 1.50 | 1.45 | .05 | 1189. |
| 1.01 | 14.00 | 28 | .11 | .00 | .11 | 1. | 1.02 | 15.00 | 78 | 1.50 | 1.45 | .05 | 1580. |
| 1.01 | 14.30 | 29 | .14 | .00 | .14 | 2. | 1.02 | 15.30 | 79 | 1.82 | 1.77 | .05 | 1994. |
| 1.01 | 15.00 | 30 | .14 | .00 | .14 | 2. | 1.02 | 16.00 | 80 | 5.77 | 5.72 | .05 | 2517. |
| 1.01 | 15.30 | 31 | .17 | .08 | .09 | 4. | 1.02 | 16.30 | 81 | 1.40 | 1.35 | .05 | 3198. |
| 1.01 | 16.00 | 32 | .54 | .49 | .05 | 22. | 1.02 | 17.00 | 82 | 1.40 | 1.35 | .05 | 3934. |
| 1.01 | 16.30 | 33 | .13 | .08 | .05 | 65. | 1.02 | 17.30 | 83 | 1.10 | 1.05 | .05 | 4599. |
| 1.01 | 17.00 | 34 | .13 | .08 | .05 | 124. | 1.02 | 18.00 | 84 | 1.10 | 1.05 | .05 | 5060. |
| 1.01 | 17.30 | 35 | .10 | .05 | .05 | 189. | 1.02 | 18.30 | 85 | .07 | .02 | .05 | 5222. |
| 1.01 | 18.00 | 36 | .10 | .05 | .05 | 242. | 1.02 | 19.00 | 86 | .07 | .02 | .05 | 5022. |
| 1.01 | 18.30 | 37 | .01 | .00 | .01 | 272. | 1.02 | 19.30 | 87 | .07 | .02 | .05 | 4572. |
| 1.01 | 19.00 | 38 | .01 | .00 | .01 | 273. | 1.02 | 20.00 | 88 | .07 | .02 | .05 | 4039. |
| 1.01 | 19.30 | 39 | .01 | .00 | .01 | 244. | 1.02 | 20.30 | 89 | .07 | .02 | .05 | 3470. |
| 1.01 | 20.00 | 40 | .01 | .00 | .01 | 217. | 1.02 | 21.00 | 90 | .07 | .02 | .05 | 2917. |
| 1.01 | 20.30 | 41 | .01 | .00 | .01 | 196. | 1.02 | 21.30 | 91 | .07 | .02 | .05 | 2424. |
| 1.01 | 21.00 | 42 | .01 | .00 | .01 | 155. | 1.02 | 22.00 | 92 | .07 | .02 | .05 | 2015. |

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| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.01 | 21.30 | 43 | .01 | .00 | .01 | 128. | | 1.02 | 22.30 | 93 | .07 | .02 | .05 | 1677. |
| 1.01 | 22.00 | 44 | .01 | .00 | .01 | 106. | | 1.02 | 23.00 | 94 | .07 | .02 | .05 | 1397. |
| 1.01 | 22.30 | 45 | .01 | .00 | .01 | 88. | | 1.02 | 23.30 | 95 | .07 | .02 | .05 | 1167. |
| 1.01 | 23.00 | 46 | .01 | .00 | .01 | 72. | | 1.03 | 0.00 | 96 | .07 | .02 | .05 | 977. |
| 1.01 | 23.30 | 47 | .01 | .00 | .01 | 60. | | 1.03 | .30 | 97 | 0.00 | 0.00 | 0.00 | 819. |
| 1.02 | 0.00 | 48 | .01 | .00 | .01 | 49. | | 1.03 | 1.00 | 98 | 0.00 | 0.00 | 0.00 | 687. |
| 1.02 | .30 | 49 | .05 | .00 | .05 | 41. | | 1.03 | 1.30 | 99 | 0.00 | 0.00 | 0.00 | 575. |
| 1.02 | 1.00 | 50 | .05 | .00 | .05 | 34. | | 1.03 | 2.00 | 100 | 0.00 | 0.00 | 0.00 | 480. |
| | | | | | | | | | | SUM | 25.65 | 21.94 | 3.71 | 68462. |
| | | | | | | | | | | | ( 652.) | ( 557.) | ( 94.) | ( 1938.63) |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 5222. | 3997. | 1366. | 682. | 68220. |
| CMS | 148. | 110. | 39. | 19. | 1932. |
| INCHES | | 14.50 | 20.34 | 21.15 | 21.15 |
| MM | | 368.28 | 516.51 | 537.30 | 537.30 |
| AC-FT | | 1932. | 2710. | 2819. | 2819. |
| THOUS CU M | | 2383. | 3343. | 3477. | 3477. |

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. |
| 4. | 22. | 65. | 124. | 189. | 242. | 272. | 270. | 246. | 217. |
| 184. | 155. | 125. | 106. | 85. | 72. | 60. | 49. | 41. | 34. |
| 26. | 23. | 23. | 16. | 14. | 12. | 10. | 9. | 7. | 6. |
| 9. | 19. | 43. | 71. | 111. | 154. | 193. | 226. | 253. | 276. |
| 294. | 310. | 343. | 432. | 599. | 855. | 1189. | 1580. | 1994. | 2517. |
| 3196. | 3934. | 4559. | 5063. | 5222. | 5022. | 4572. | 4038. | 3470. | 2917. |
| 2424. | 2015. | 1677. | 1397. | 1167. | 977. | 819. | 687. | 575. | 480. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 5222. | 3897. | 1366. | 682. | 68220. |
| CMS | 148. | 110. | 39. | 19. | 1932. |
| INCHES | | 14.50 | 20.34 | 21.15 | 21.15 |
| MM | | 368.28 | 516.51 | 537.30 | 537.30 |
| AC-FT | | 1932. | 2710. | 2819. | 2819. |
| THOUS CU M | | 2383. | 3343. | 3477. | 3477. |

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 3. | 17. | 49. | 93. | 141. | 181. | 204. | 202. | 185. | 163. |
| 139. | 116. | 95. | 80. | 66. | 54. | 45. | 37. | 31. | 25. |
| 21. | 18. | 15. | 12. | 10. | 9. | 7. | 6. | 5. | 5. |
| 6. | 14. | 33. | 53. | 83. | 115. | 145. | 169. | 190. | 207. |
| 221. | 232. | 259. | 324. | 449. | 641. | 992. | 1185. | 1496. | 1888. |
| 2399. | 2950. | 3449. | 3795. | 3916. | 3767. | 3429. | 3029. | 2603. | 2188. |
| 1815. | 1511. | 1253. | 1049. | 875. | 732. | 614. | 515. | 431. | 360. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 3916. | 2922. | 1025. | 512. | 51165. |
| CMS | 111. | 83. | 29. | 14. | 1449. |
| INCHES | | 10.87 | 15.25 | 15.87 | 15.87 |

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| | | | | |
|---|---|---|---|---|
| MM | 276.21 | 327.39 | 402.98 | 402.98 |
| AC-FT | 1449. | 2032. | 2114. | 2114. |
| THOUS CU M | 1788. | 2507. | 2608. | 2608. |

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 1. | 1. | 1. | 1. |
| 2. | 11. | 32. | 62. | 94. | 121. | 136. | 135. | 123. | 138. |
| 93. | 78. | 64. | 53. | 44. | 36. | 30. | 25. | 20. | 17. |
| 14. | 12. | 11. | 9. | 7. | 6. | 5. | 4. | 4. | 3. |
| 4. | 9. | 23. | 36. | 56. | 77. | 97. | 113. | 127. | 138. |
| 147. | 155. | 172. | 216. | 330. | 427. | 595. | 790. | 997. | 1259. |
| 1599. | 1967. | 2300. | 2530. | 2611. | 2511. | 2286. | 2019. | 1735. | 1458. |
| 1212. | 1007. | 838. | 699. | 583. | 486. | 409. | 343. | 288. | 240. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 2611. | 1948. | 683. | 341. | 34110. |
| CMS | 74. | 55. | 19. | 10. | 966. |
| INCHES | | 7.25 | 10.17 | 10.58 | 10.58 |
| MM | | 184.14 | 258.26 | 268.65 | 268.65 |
| AC-FT | | 966. | 1355. | 1410. | 1410. |
| THOUS CU M | | 1192. | 1671. | 1739. | 1739. |

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 1. | 6. | 16. | 31. | 47. | 60. | 68. | 67. | 62. | 54. |
| 46. | 39. | 32. | 27. | 22. | 18. | 15. | 12. | 10. | 8. |
| 7. | 6. | 5. | 4. | 3. | 3. | 2. | 2. | 2. | 2. |
| 2. | 5. | 10. | 19. | 28. | 38. | 45. | 56. | 63. | 69. |
| 74. | 77. | 86. | 108. | 150. | 214. | 297. | 395. | 499. | 629. |
| 800. | 983. | 1150. | 1265. | 1305. | 1256. | 1143. | 1010. | 868. | 729. |
| 606. | 504. | 419. | 349. | 292. | 244. | 205. | 172. | 144. | 120. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 1305. | 974. | 342. | 171. | 17055. |
| CMS | 37. | 28. | 10. | 5. | 483. |
| INCHES | | 3.62 | 5.08 | 5.29 | 5.29 |
| MM | | 92.07 | 129.13 | 134.33 | 134.33 |
| AC-FT | | 483. | 677. | 705. | 705. |
| THOUS CU M | | 596. | 836. | 869. | 869. |

Sheet 15 of 57

********** ********** ********** ********** **********

COMBINE HYDROGRAPHS

3 COMBINE 2 HYDROGRAPHS AT NODE 101

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

SUM OF 2 HYDROGRAPHS AT 1 PLAN 3 RTIO 1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 3. | 3. | 4. |
| 4. | 25. | 68. | 128. | 193. | 249. | 282. | 284. | 264. | 239. |
| 210. | 183. | 152. | 127. | 105. | 87. | 73. | 60. | 50. | 42. |
| 35. | 29. | 25. | 21. | 18. | 16. | 14. | 12. | 10. | 9. |
| 13. | 32. | 65. | 124. | 197. | 278. | 359. | 431. | 494. | 546. |
| 391. | 623. | 695. | 855. | 1151. | 1604. | 2211. | 2943. | 3756. | 4788. |
| 6107. | 7526. | 8842. | 9904. | 10467. | 10419. | 9853. | 8958. | 7905. | 6833. |
| 5823. | 4933. | 4169. | 3528. | 2992. | 2541. | 2161. | 1839. | 1565. | 1328. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 10462. | 8126. | 2895. | 1419. | 141876. |
| CMS | 296. | 230. | 82. | 40. | 4017. |
| INCHES | | 14.32 | 19.98 | 20.40 | 20.40 |
| MM | | 356.21 | 507.56 | 518.28 | 518.28 |
| AC-FT | | 4029. | 5741. | 5863. | 5863. |
| THOUS CU M | | 4970. | 7082. | 7231. | 7231. |

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. | 2. | 3. |
| 5. | 19. | 51. | 96. | 145. | 186. | 211. | 213. | 198. | 179. |
| 157. | 135. | 114. | 95. | 79. | 66. | 54. | 45. | 38. | 31. |
| 26. | 22. | 17. | 15. | 14. | 12. | 10. | 9. | 8. | 7. |
| 13. | 24. | 51. | 93. | 147. | 208. | 269. | 323. | 370. | 410. |
| 443. | 471. | 521. | 641. | 853. | 1203. | 1658. | 2207. | 2817. | 3591. |
| 4550. | 5645. | 6645. | 7428. | 7847. | 7815. | 7390. | 6718. | 5929. | 5125. |
| 4367. | 3697. | 3126. | 2646. | 2244. | 1906. | 1621. | 1380. | 1173. | 996. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 7847. | 6094. | 2171. | 1064. | 106407. |
| CMS | 222. | 173. | 61. | 30. | 3013. |
| INCHES | | 10.52 | 14.99 | 15.30 | 15.30 |
| MM | | 267.16 | 380.67 | 388.71 | 388.71 |
| AC-FT | | 3022. | 4306. | 4397. | 4397. |
| THOUS CU M | | 3728. | 5311. | 5424. | 5424. |

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. |
| 3. | 12. | 34. | 64. | 97. | 124. | 141. | 142. | 132. | 119. |
| 105. | 90. | 76. | 63. | 53. | 44. | 36. | 30. | 25. | 21. |
| 15. | 15. | 12. | 11. | 9. | 8. | 7. | 6. | 5. | 5. |
| 7. | 15. | 36. | 62. | 93. | 139. | 179. | 216. | 247. | 273. |
| 295. | 314. | 363. | 429. | 575. | 807. | 1106. | 1472. | 1878. | 2394. |
| 3153. | 3763. | 4451. | 4952. | 5231. | 5210. | 4927. | 4479. | 3952. | 3416. |
| 2911. | 2465. | 2084. | 1764. | 1496. | 1270. | 1081. | 920. | 782. | 664. |

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| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 5231. | 4063. | 1447. | 709. | 70938. |
| CMS | 148. | 115. | 41. | 20. | 2009. |
| INCHES | | 7.01 | 9.99 | 10.20 | 10.20 |
| MM | | 178.11 | 253.78 | 259.14 | 259.14 |
| AC-FT | | 2015. | 2871. | 2931. | 2931. |
| THOUS CU M | | 2485. | 3541. | 3616. | 3616. |

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1, RTIO 4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 1. | 1. | 1. | 1. |
| 2. | 6. | 17. | 32. | 48. | 62. | 70. | 71. | 66. | 60. |
| 52. | 45. | 39. | 32. | 26. | 22. | 18. | 15. | 13. | 10. |
| 9. | 7. | 6. | 5. | 5. | 4. | 3. | 3. | 3. | 2. |
| 3. | 9. | 17. | 31. | 49. | 69. | 90. | 108. | 123. | 137. |
| 142. | 157. | 174. | 214. | 298. | 401. | 553. | 736. | 939. | 1197. |
| 1527. | 1882. | 2215. | 2475. | 2616. | 2605. | 2463. | 2239. | 1976. | 1708. |
| 1456. | 1232. | 1042. | 882. | 744. | 635. | 540. | 460. | 391. | 332. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 2616. | 2031. | 724. | 355. | 35469. |
| CMS | 74. | 58. | 20. | 10. | 1004. |
| INCHES | | 3.51 | 5.00 | 5.10 | 5.10 |
| MM | | 89.05 | 126.89 | 129.57 | 129.57 |
| AC-FT | | 1007. | 1435. | 1466. | 1466. |
| THOUS CU M | | 1243. | 1770. | 1808. | 1808. |

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

& CHANNEL ROUTE TO NODE 102

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|---|---|---|---|---|---|---|---|---|
| 2 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

ROUTING DATA

| QLOSS | CLOSS | AVG | IRES | ISAME | IOPT | IPMP | | LSTR |
|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.000 | 0.00 | 0 | 1 | 0 | 0 | | 0 |

| NSTPS | NSTDL | LAG | AMSKK | X | TSK | STORA | ISPRAT |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 2.000 | .500 | 0.000 | 0. | 0 |

AMSKK IS NOT WITHIN THE RECOMMENDED LIMITS

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STATION 2, PLAN 1, RTIO 1

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3. | 3. | 3. | 3. | 3. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 1. | -6. | -21. | -21. | -0. | 44. | 106. | 175. | 230. | 259. |
| 266. | 263. | 247. | 224. | 193. | 171. | 147. | 124. | 105. | 88. |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 74. | 62. | 51. | 43. | 36. | 30. | 26. | 22. | 19. | 16. |
| 11. | 1. | -9. | -11. | -1. | 29. | 80. | 148. | 224. | 300. |
| 372. | 437. | 473. | 466. | 444. | 455. | 550. | 775. | 1155. | 1576. |
| 2070. | 2833. | 3609. | 5265. | 6745. | 8282. | 9476. | 10165. | 10314. | 9993. |
| 9335. | 8466. | 7509. | 6556. | 5667. | 4867. | 4164. | 3556. | 3034. | 2588. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 10314. | 8135. | 2735. | 1341. | 134053. |
| CMS | 292. | 230. | 77. | 38. | 3796. |
| INCHES | | 14.04 | 18.88 | 19.28 | 19.28 |
| MM | | 356.59 | 479.61 | 489.70 | 489.70 |
| AC-FT | | 4034. | 5425. | 5539. | 5539. |
| THOUS CU M | | 4975. | 6692. | 6833. | 6833. |

STATION 2, PLAN 1, RTIO 2

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | -6. | -15. | -16. | -0. | 33. | 79. | 131. | 172. | 194. |
| 201. | 197. | 185. | 168. | 148. | 129. | 110. | 93. | 79. | 66. |
| 55. | 46. | 39. | 32. | 27. | 23. | 19. | 16. | 14. | 12. |
| 6. | 1. | -7. | -8. | -1. | 22. | 60. | 111. | 168. | 225. |
| 279. | 328. | 355. | 349. | 333. | 341. | 413. | 582. | 866. | 1182. |
| 1553. | 2125. | 2932. | 3949. | 5389. | 6211. | 7107. | 7624. | 7735. | 7495. |
| 7001. | 6350. | 5632. | 4917. | 4250. | 3650. | 3123. | 2667. | 2276. | 1941. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 7735. | 6101. | 2051. | 1005. | 100540. |
| CMS | 219. | 173. | 58. | 28. | 2847. |
| INCHES | | 10.53 | 14.16 | 14.46 | 14.46 |
| MM | | 267.44 | 359.71 | 367.28 | 367.28 |
| AC-FT | | 3025. | 4069. | 4155. | 4155. |
| THOUS CU M | | 3732. | 5019. | 5125. | 5125. |

STATION 2, PLAN 1, RTIO 3

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 0. | -4. | -10. | -11. | -0. | 22. | 53. | 87. | 115. | 130. |
| 134. | 131. | 123. | 112. | 99. | 86. | 73. | 62. | 52. | 44. |
| 37. | 31. | 26. | 22. | 18. | 15. | 13. | 11. | 9. | 8. |
| 5. | 1. | -4. | -6. | -0. | 15. | 40. | 74. | 112. | 150. |
| 186. | 219. | 236. | 233. | 222. | 227. | 275. | 388. | 577. | 788. |
| 1035. | 1416. | 1954. | 2632. | 3393. | 4141. | 4738. | 5082. | 5157. | 4997. |
| 4668. | 4233. | 3754. | 3278. | 2833. | 2434. | 2082. | 1778. | 1517. | 1294. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 5157. | 4067. | 1368. | 670. | 67027. |
| CMS | 146. | 115. | 39. | 19. | 1898. |
| INCHES | | 7.02 | 9.44 | 9.64 | 9.64 |
| MM | | 178.29 | 239.81 | 244.85 | 244.85 |
| AC-FT | | 2017. | 2713. | 2770. | 2770. |

Sheet 18 of 57

| | | | | |
|---|---|---|---|---|
| THOUS CU M | 2488. | 3346. | 3416. | 3416. |

STATION 2, PLAN 1, RTIO 4

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | -2. | -5. | -5. | -0. | 11. | 26. | 44. | 57. | 65. |
| 67. | 66. | 62. | 56. | 49. | 43. | 37. | 31. | 26. | 22. |
| 18. | 15. | 13. | 11. | 9. | 8. | 6. | 5. | 5. | 4. |
| 3. | 0. | -2. | -3. | -0. | 7. | 20. | 37. | 56. | 75. |
| 93. | 109. | 115. | 116. | 111. | 114. | 138. | 194. | 289. | 394. |
| 516. | 706. | 977. | 1316. | 1696. | 2070. | 2369. | 2541. | 2578. | 2498. |
| 2334. | 2117. | 1877. | 1639. | 1417. | 1217. | 1041. | 889. | 759. | 647. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 2578. | 2034. | 684. | 335. | 33513. |
| CMS | 73. | 58. | 19. | 9. | 949. |
| INCHES | | 3.51 | 4.72 | 4.82 | 4.82 |
| MM | | 89.15 | 119.90 | 122.43 | 122.43 |
| AC-FT | | 1008. | 1356. | 1385. | 1385. |
| THOUS CU M | | 1244. | 1673. | 1708. | 1708. |

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

5 SUB-BASIN (3) RUNOFF

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|---|---|---|---|---|---|---|---|---|
| 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

HYDROGRAPH DATA

| IHYDG | IUHG | TAREA | SNAP | TRSDA | TRSPC | RATIO | ISNOW | ISAME | LOCAL |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 2.33 | 0.00 | 15.24 | 0.00 | 0.000 | 0 | 1 | 0 |

PRECIP DATA

| SPFE | PMS | R6 | R12 | R24 | R48 | R72 | R96 |
|---|---|---|---|---|---|---|---|
| 0.00 | 22.50 | 109.00 | 120.00 | 128.00 | 140.00 | 0.00 | 0.00 |

TRSPC COMPUTED BY THE PROGRAM IS .814

LOSS DATA

| LROPT | STRKR | DLTKR | RTIOL | ERAIN | STRKS | RTIOK | STRTL | CNSTL | ALSMX | RTIMP |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.30 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 2.00 | .10 | 0.00 | .02 |

UNIT HYDROGRAPH DATA
TP= 4.70 CP= .64 NTA= 0

Sheet 19 of 57

RECESSION DATA
STRTQ= -.50 QRCSN= -.05 RTIOR= 1.60

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=10.71 AND R= 8.24 INTERVALS

UNIT HYDROGRAPH 50 END-OF-PERIOD ORDINATES, LAG= 4.68 HOURS, CP= .64 VOL= 1.00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 7. | 26. | 52. | 82. | 114. | 146. | 174. | 194. | 206. | 210. |
| 201. | 182. | 161. | 143. | 127. | 112. | 99. | 88. | 78. | 69. |
| 61. | 54. | 48. | 42. | 35. | 33. | 29. | 26. | 23. | 20. |
| 18. | 16. | 14. | 13. | 11. | 10. | 9. | 8. | 7. | 6. |
| 5. | 5. | 4. | 4. | 3. | 3. | 3. | 2. | 2. | 2. |

0

END-OF-PERIOD FLOW

| MO.DA | HR.MN | PERIOD | RAIN | EXCS | LOSS | COMP Q | MO.DA | HR.MN | PERIOD | RAIN | EXCS | LOSS | COMP Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.01 | .30 | 1 | .00 | .00 | .00 | 1. | 1.02 | 1.30 | 51 | .05 | .00 | .05 | 9. |
| 1.01 | 1.00 | 2 | .00 | .00 | .00 | 1. | 1.02 | 2.00 | 52 | .05 | .00 | .05 | 8. |
| 1.01 | 1.30 | 3 | .00 | .00 | .00 | 1. | 1.02 | 2.30 | 53 | .05 | .00 | .05 | 8. |
| 1.01 | 2.00 | 4 | .00 | .00 | .00 | 1. | 1.02 | 3.00 | 54 | .05 | .00 | .05 | 7. |
| 1.01 | 2.30 | 5 | .00 | .00 | .00 | 1. | 1.02 | 3.30 | 55 | .05 | .00 | .05 | 6. |
| 1.01 | 3.00 | 6 | .00 | .00 | .00 | 1. | 1.02 | 4.00 | 56 | .05 | .00 | .05 | 6. |
| 1.01 | 3.30 | 7 | .00 | .00 | .00 | 1. | 1.02 | 4.30 | 57 | .05 | .00 | .05 | 6. |
| 1.01 | 4.00 | 8 | .00 | .00 | .00 | 1. | 1.02 | 5.00 | 58 | .05 | .00 | .05 | 5. |
| 1.01 | 4.30 | 9 | .00 | .00 | .00 | 1. | 1.02 | 5.30 | 59 | .05 | .00 | .05 | 5. |
| 1.01 | 5.00 | 10 | .00 | .00 | .00 | 1. | 1.02 | 6.00 | 60 | .05 | .00 | .05 | 5. |
| 1.01 | 5.30 | 11 | .00 | .00 | .00 | 1. | 1.02 | 6.30 | 61 | .17 | .12 | .05 | 5. |
| 1.01 | 6.00 | 12 | .00 | .00 | .00 | 1. | 1.02 | 7.00 | 62 | .17 | .12 | .05 | 8. |
| 1.01 | 6.30 | 13 | .02 | .00 | .02 | 1. | 1.02 | 7.30 | 63 | .17 | .12 | .05 | 14. |
| 1.01 | 7.00 | 14 | .02 | .00 | .02 | 1. | 1.02 | 8.00 | 64 | .17 | .12 | .05 | 24. |
| 1.01 | 7.30 | 15 | .02 | .00 | .02 | 1. | 1.02 | 8.30 | 65 | .17 | .12 | .05 | 37. |
| 1.01 | 8.00 | 16 | .02 | .00 | .02 | 1. | 1.02 | 9.00 | 66 | .17 | .12 | .05 | 54. |
| 1.01 | 8.30 | 17 | .02 | .00 | .02 | 1. | 1.02 | 9.30 | 67 | .17 | .12 | .05 | 75. |
| 1.01 | 9.00 | 18 | .02 | .00 | .02 | 1. | 1.02 | 10.00 | 68 | .17 | .12 | .05 | 98. |
| 1.01 | 9.30 | 19 | .02 | .00 | .02 | 1. | 1.02 | 10.30 | 69 | .17 | .12 | .05 | 122. |
| 1.01 | 10.00 | 20 | .02 | .00 | .02 | 1. | 1.02 | 11.00 | 70 | .17 | .12 | .05 | 146. |
| 1.01 | 10.30 | 21 | .02 | .00 | .02 | 1. | 1.02 | 11.30 | 71 | .17 | .12 | .05 | 170. |
| 1.01 | 11.00 | 22 | .02 | .00 | .02 | 1. | 1.02 | 12.00 | 72 | .17 | .12 | .05 | 192. |
| 1.01 | 11.30 | 23 | .02 | .00 | .02 | 1. | 1.02 | 12.30 | 73 | 1.00 | .95 | .05 | 216. |
| 1.01 | 12.00 | 24 | .02 | .00 | .02 | 1. | 1.02 | 13.00 | 74 | 1.00 | .95 | .05 | 255. |
| 1.01 | 12.30 | 25 | .09 | .00 | .09 | 1. | 1.02 | 13.30 | 75 | 1.20 | 1.15 | .05 | 314. |
| 1.01 | 13.00 | 26 | .09 | .00 | .09 | 1. | 1.02 | 14.00 | 76 | 1.20 | 1.15 | .05 | 400. |
| 1.01 | 13.30 | 27 | .11 | .00 | .11 | 1. | 1.02 | 14.30 | 77 | 1.50 | 1.45 | .05 | 519. |
| 1.01 | 14.00 | 28 | .11 | .00 | .11 | 1. | 1.02 | 15.00 | 78 | 1.50 | 1.45 | .05 | 675. |
| 1.01 | 14.30 | 29 | .14 | .00 | .14 | 2. | 1.02 | 15.30 | 79 | 1.82 | 1.77 | .05 | 870. |
| 1.01 | 15.00 | 30 | .14 | .00 | .14 | 2. | 1.02 | 16.00 | 80 | 5.77 | 5.72 | .05 | 1129. |
| 1.01 | 15.30 | 31 | .17 | .00 | .17 | 2. | 1.02 | 16.30 | 81 | 1.40 | 1.35 | .05 | 1464. |
| 1.01 | 16.00 | 32 | .54 | .01 | .53 | 3. | 1.02 | 17.00 | 82 | 1.40 | 1.35 | .05 | 1946. |
| 1.01 | 16.30 | 33 | .13 | .00 | .13 | 3. | 1.02 | 17.30 | 83 | 1.10 | 1.05 | .05 | 2243. |
| 1.01 | 17.00 | 34 | .13 | .00 | .13 | 4. | 1.02 | 18.00 | 84 | 1.10 | 1.05 | .05 | 2632. |
| 1.01 | 17.30 | 35 | .10 | .01 | .09 | 5. | 1.02 | 18.30 | 85 | .07 | .02 | .05 | 2986. |
| 1.01 | 18.00 | 36 | .10 | .05 | .05 | 6. | 1.02 | 19.00 | 86 | .07 | .02 | .05 | 3268. |
| 1.01 | 18.30 | 37 | .01 | .00 | .01 | 8. | 1.02 | 19.30 | 87 | .07 | .02 | .05 | 3454. |
| 1.01 | 19.00 | 38 | .01 | .00 | .01 | 10. | 1.02 | 20.00 | 88 | .07 | .02 | .05 | 3537. |
| 1.01 | 19.30 | 39 | .01 | .00 | .01 | 12. | 1.02 | 20.30 | 89 | .07 | .02 | .05 | 3518. |
| 1.01 | 20.00 | 40 | .01 | .00 | .01 | 14. | 1.02 | 21.00 | 90 | .07 | .02 | .05 | 3387. |
| 1.01 | 20.30 | 41 | .01 | .00 | .01 | 16. | 1.02 | 21.30 | 91 | .07 | .02 | .05 | 3164. |
| 1.01 | 21.00 | 42 | .01 | .00 | .01 | 17. | 1.02 | 22.00 | 92 | .07 | .02 | .05 | 2899. |
| 1.01 | 21.30 | 43 | .01 | .00 | .01 | 18. | 1.02 | 22.30 | 93 | .07 | .02 | .05 | 2624. |
| 1.01 | 22.00 | 44 | .01 | .00 | .01 | 18. | 1.02 | 23.00 | 94 | .07 | .02 | .05 | 2353. |
| 1.01 | 22.30 | 45 | .01 | .00 | .01 | 18. | 1.02 | 23.30 | 95 | .07 | .02 | .05 | 2096. |
| 1.01 | 23.00 | 46 | .01 | .00 | .01 | 16. | 1.03 | 0.00 | 96 | .07 | .02 | .05 | 1965. |
| 1.01 | 23.30 | 47 | .01 | .00 | .01 | 15. | 1.03 | .30 | 97 | 0.00 | 0.00 | 0.00 | 1659. |
| 1.02 | 0.00 | 48 | .01 | .00 | .01 | 13. | 1.03 | 1.00 | 98 | 0.00 | 0.00 | 0.00 | 1477. |
| 1.02 | .30 | 49 | .05 | .00 | .05 | 12. | 1.03 | 1.30 | 99 | 0.00 | 0.00 | 0.00 | 1315. |
| 1.02 | 1.00 | 50 | .05 | .00 | .05 | 11. | 1.03 | 2.00 | 100 | 0.00 | 0.00 | 0.00 | 1171. |

Sheet 20 of 57

SUM 25.65 21.22 4.43 54599.
( 652.)( 539.)( 113.)( 1546.07)

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 3537. | 2999. | 1120. | 540. | 54009. |
| CMS | 100. | 85. | 32. | 15. | 1529. |
| INCHES | | 11.97 | 17.88 | 17.97 | 17.97 |
| MM | | 304.14 | 454.19 | 456.41 | 456.41 |
| AC-FT | | 1487. | 2221. | 2232. | 2232. |
| THOUS CU M | | 1834. | 2740. | 2753. | 2753. |

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. |
| 2. | 3. | 3. | 4. | 5. | 6. | 8. | 10. | 12. | 14. |
| 16. | 17. | 18. | 18. | 18. | 16. | 15. | 13. | 12. | 11. |
| 9. | 8. | 8. | 7. | 6. | 6. | 6. | 5. | 5. | 5. |
| 5. | 8. | 14. | 24. | 37. | 54. | 75. | 98. | 122. | 146. |
| 170. | 192. | 215. | 255. | 314. | 400. | 519. | 675. | 870. | 1129. |
| 1454. | 1846. | 2243. | 2632. | 2986. | 3268. | 3454. | 3537. | 3518. | 3387. |
| 3164. | 2899. | 2624. | 2353. | 2096. | 1865. | 1659. | 1477. | 1315. | 1171. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 3537. | 2999. | 1120. | 540. | 54009. |
| CMS | 100. | 85. | 32. | 15. | 1529. |
| INCHES | | 11.97 | 17.88 | 17.97 | 17.97 |
| MM | | 304.14 | 454.19 | 456.41 | 456.41 |
| AC-FT | | 1487. | 2221. | 2232. | 2232. |
| THOUS CU M | | 1834. | 2740. | 2753. | 2753. |

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 2. | 2. | 2. | 3. | 4. | 4. | 6. | 7. | 9. | 10. |
| 12. | 13. | 13. | 13. | 13. | 12. | 11. | 10. | 9. | 8. |
| 7. | 6. | 6. | 5. | 5. | 4. | 4. | 4. | 4. | 4. |
| 4. | 6. | 11. | 18. | 28. | 41. | 56. | 73. | 91. | 110. |
| 126. | 144. | 162. | 191. | 235. | 300. | 389. | 506. | 652. | 847. |
| 1098. | 1355. | 1693. | 1974. | 2239. | 2451. | 2590. | 2653. | 2638. | 2540. |
| 2373. | 2174. | 1963. | 1764. | 1572. | 1399. | 1245. | 1105. | 986. | 878. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 2653. | 2249. | 840. | 405. | 40507. |
| CMS | 75. | 64. | 24. | 11. | 1147. |
| INCHES | | 8.98 | 13.41 | 13.48 | 13.48 |
| MM | | 228.10 | 340.65 | 342.31 | 342.31 |
| AC-FT | | 1115. | 1666. | 1674. | 1674. |
| THOUS CU M | | 1376. | 2055. | 2065. | 2065. |

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |

Sheet 21 of 57

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 2. | 2. | 2. | 3. | 4. | 5. | 6. | 7. |
| 8. | 9. | 9. | 9. | 9. | 8. | 7. | 7. | 6. | 5. |
| 5. | 4. | 4. | 3. | 3. | 3. | 3. | 3. | 3. | 2. |
| 3. | 4. | 7. | 12. | 19. | 27. | 37. | 49. | 61. | 73. |
| 85. | 96. | 108. | 127. | 157. | 200. | 260. | 333. | 435. | 564. |
| 732. | 923. | 1122. | 1316. | 1493. | 1634. | 1727. | 1769. | 1759. | 1693. |
| 1582. | 1449. | 1312. | 1176. | 1048. | 932. | 830. | 739. | 658. | 585. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 1769. | 1500. | 560. | 270. | 27004. |
| CMS | 50. | 42. | 16. | 8. | 765. |
| INCHES | | 5.99 | 8.94 | 8.98 | 8.98 |
| MM | | 152.07 | 227.10 | 228.20 | 228.20 |
| AC-FT | | 744. | 1110. | 1116. | 1116. |
| THOUS CU M | | 917. | 1370. | 1376. | 1376. |

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. | 3. | 3. |
| 4. | 4. | 4. | 4. | 4. | 4. | 4. | 3. | 3. | 3. |
| 2. | 2. | 2. | 2. | 2. | 1. | 1. | 1. | 1. | 1. |
| 1. | 2. | 4. | 6. | 9. | 14. | 19. | 24. | 30. | 37. |
| 43. | 48. | 54. | 64. | 78. | 100. | 130. | 169. | 217. | 282. |
| 366. | 462. | 561. | 652. | 746. | 817. | 863. | 884. | 879. | 847. |
| 791. | 725. | 656. | 588. | 524. | 466. | 415. | 369. | 329. | 293. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 884. | 750. | 280. | 135. | 13502. |
| CMS | 25. | 21. | 8. | 4. | 382. |
| INCHES | | 2.99 | 4.47 | 4.49 | 4.49 |
| MM | | 76.03 | 113.55 | 114.10 | 114.10 |
| AC-FT | | 372. | 555. | 558. | 558. |
| THOUS CU M | | 459. | 685. | 688. | 688. |

********** ********** ********** ********** **********

COMBINE HYDROGRAPHS

6 COMBINE 2 HYDROGRAPHS AT NODE 102

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4. | 4. | 4. | 4. | 3. | 3. | 3. | 3. | 3. | 3. |
| 3. | 3. | 3. | 3. | 3. | 3. | 2. | 2. | 3. | 3. |
| 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 4. |
| 3. | -5. | -17. | -17. | 4. | 50. | 113. | 185. | 242. | 273. |
| 264. | 280. | 264. | 242. | 215. | 185. | 162. | 138. | 117. | 99. |
| 83. | 70. | 59. | 50. | 43. | 36. | 31. | 27. | 24. | 21. |

Sheet 22 of 57

AD-A107 407 TIPPETTS-ABBETT-MCCARTHY-STRATTON NEW YORK F/G 13/13
NATIONAL DAM SAFETY PROGRAM. MAMARONECK RESERVOIR DAM (INVENTOR--ETC(U)
AUG 81 E O'BRIEN DACW51-81-C-0008

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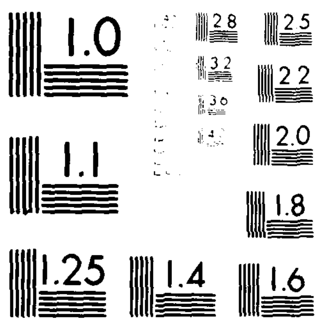
12-81
DTIC




MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 16. | 9. | 5. | 12. | 36. | 84. | 155. | 245. | 345. | 447. |
| 542. | 629. | 689. | 720. | 759. | 855. | 1069. | 1450. | 2024. | 2735. |
| 3535. | 4679. | 6152. | 7897. | 9771. | 11550. | 12930. | 13702. | 13831. | 13380. |
| 12499. | 11365. | 10133. | 8909. | 7763. | 6732. | 5624. | 5034. | 4350. | 3759. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 13831. | 11096. | 3555. | 1881. | 188062. |
| CMS | 392. | 314. | 109. | 53. | 5325. |
| INCHES | | 13.37 | 18.58 | 18.88 | 18.88 |
| MM | | 339.59 | 471.94 | 479.65 | 479.65 |
| AC-FT | | 5502. | 7646. | 7771. | 7771. |
| THOUS CU M | | 6787. | 9431. | 9586. | 9586. |

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3. | 3. | 3. | 3. | 3. | 3. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 3. |
| 2. | -4. | -13. | -13. | 3. | 37. | 85. | 138. | 181. | 205. |
| 213. | 210. | 195. | 181. | 162. | 141. | 121. | 103. | 88. | 74. |
| 62. | 53. | 44. | 38. | 32. | 27. | 24. | 20. | 18. | 16. |
| 12. | 7. | 6. | 9. | 27. | 63. | 116. | 184. | 259. | 335. |
| 407. | 472. | 517. | 540. | 569. | 641. | 802. | 1088. | 1518. | 2029. |
| 2651. | 3509. | 4614. | 5922. | 7328. | 8663. | 9698. | 10277. | 10373. | 10035. |
| 9374. | 8523. | 7600. | 6681. | 5822. | 5049. | 4368. | 3775. | 3262. | 2819. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 10373. | 8322. | 2891. | 1410. | 141047. |
| CMS | 294. | 236. | 82. | 40. | 3994. |
| INCHES | | 10.03 | 13.94 | 14.16 | 14.16 |
| MM | | 254.69 | 353.96 | 359.74 | 359.74 |
| AC-FT | | 4126. | 5735. | 5828. | 5828. |
| THOUS CU M | | 5090. | 7074. | 7189. | 7189. |

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. |
| 2. | -3. | -9. | -9. | 2. | 25. | 57. | 92. | 121. | 137. |
| 142. | 140. | 132. | 121. | 108. | 94. | 81. | 69. | 58. | 49. |
| 42. | 35. | 30. | 25. | 21. | 18. | 16. | 14. | 12. | 10. |
| 6. | 5. | 3. | 6. | 18. | 42. | 78. | 123. | 173. | 223. |
| 271. | 314. | 345. | 360. | 379. | 427. | 535. | 725. | 1012. | 1352. |
| 1767. | 2340. | 3076. | 3948. | 4886. | 5775. | 6465. | 6851. | 6916. | 6690. |
| 6249. | 5682. | 5065. | 4454. | 3881. | 3366. | 2912. | 2517. | 2175. | 1980. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 6916. | 5543. | 1927. | 940. | 94031. |
| CMS | 196. | 157. | 55. | 27. | 2663. |
| INCHES | | 6.68 | 9.29 | 9.44 | 9.44 |
| MM | | 169.30 | 235.97 | 239.83 | 239.83 |
| AC-FT | | 2751. | 3823. | 3886. | 3886. |
| THOUS CU M | | 3393. | 4716. | 4793. | 4793. |

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```
                              SUM OF 2 HYDROGRAPHS AT       2  PLAN 1  RTIO 4
        1.        1.        1.        1.        1.        1.        1.        1.        1.        1.
        1.        1.        1.        1.        1.        1.        1.        1.        1.        1.
        1.        1.        1.        1.        1.        1.        1.        1.        1.        1.
        1.       -1.       -4.       -4.        1.       12.       28.       46.       60.       68.
       71.       70.       66.       50.       54.       47.       40.       34.       29.       25.
       21.       18.       15.       13.       11.        9.        R.        7.        6.        5.
        4.        2.        1.        3.        9.       21.       39.       61.       86.      112.
      136.      157.      172.      180.      190.      214.      267.      363.      506.      676.
      884.     1170.     1538.     1974.     2443.     288P.     3233.     3426.     3458.     3345.
     3125.     2841.     2533.     2227.     1941.     1683.     1456.     1258.     1087.      940.

                                    PEAK    6-HOUR   24-HOUR   72-HOUR   TOTAL VOLUME
                           CFS     3458.     2774.      964.      470.       47016.
                           CMS       98.       79.       27.       13.        1331.
                        INCHES                3.34      4.65      4.72        4.72
                            MM               84.90    117.99    119.91      119.91
                         AC-FT                1375.     1912.     1943.       1943.
                    THOUS CU M                1697.     2355.     2396.       2396.


               **********          **********          **********          **********          **********

                                        HYDROGRAPH ROUTING

                     7 CHANNEL ROUTE TO NODE 103

                               ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                                   3       1       0       0       0       0       1       0       0
                                                        ROUTING DATA
                      QLOSS    CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
                        0.0    0.000    0.00       0       1       0       0               0

                               NSTPS   NSTDL    LAG   AMSKK       X     TSK   STORA  ISPRAT
                                   1       0      0   2.000    .500   0.000      0.       0

AMSKK IS NOT WITHIN THE RECOMMENDED LIMITS

                                 STATION       3, PLAN 1, RTIO 1

                                              OUTFLOW
        4.        4.        4.        4.        4.        4.        4.        4.        3.        3.
        3.        3.        3.        3.        3.        3.        3.        3.        3.        3.
        3.        3.        3.        3.        3.        3.        3.        3.        3.        3.
        3.        5.       10.       -1.      -20.      -38.      -41.      -22.       26.       94.
      159.      212.      248.      26R.      273.      267.      251.      230.      205.      181.
      157.      135.      116.       99.       84.       71.       60.       51.       44.       37.
       34.       31.       25.       13.       -2.      -15.      -1R.       -3.       36.       99.
      181.      273.      379.      485.      556.      579.      561.      536.      557.      736.
     1025.     1342.     1793.     2490.     3528.     4958.     6767.     8769.    10665.    12232.
    13202.    13601.    13446.    12855.    11964.    10902.     9779.     8671.     7626.     6670.

                                    PEAK    6-HOUR   24-HOUR   72-HOUR   TOTAL VOLUME
                           CFS    13601.    11104.     3429.     1672.      167218.
                           CMS      385.      314.       97.       47.        4735.
```

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| | | | | |
|---|---|---|---|---|
| INCHES | 13.38 | 16.53 | 16.79 | 16.79 |
| MM | 339.86 | 419.79 | 426.49 | 426.49 |
| AC-FT | 5506. | 6801. | 6910. | 6910. |
| THOUS CU M | 6792. | 8389. | 8523. | 8523. |

STATION 3, PLAN 1, RTIO 2

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 2. | 6. | 3. | -1. | -15. | -28. | -31. | -16. | 20. | 70. |
| 119. | 159. | 185. | 201. | 205. | 200. | 188. | 172. | 154. | 136. |
| 116. | 102. | 87. | 74. | 63. | 53. | 45. | 38. | 33. | 28. |
| 25. | 23. | 18. | 9. | -1. | -11. | -14. | -2. | 27. | 74. |
| 136. | 205. | 284. | 363. | 417. | 434. | 421. | 402. | 418. | 552. |
| 769. | 1007. | 1345. | 1868. | 2646. | 3718. | 5075. | 6577. | 7999. | 9152. |
| 9902. | 10201. | 10084. | 9641. | 8973. | 8177. | 7334. | 6503. | 5720. | 5333. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 10201. | 8328. | 2572. | 1254. | 125414. |
| CMS | 289. | 236. | 73. | 36. | 3551. |
| INCHES | | 10.34 | 12.40 | 12.59 | 12.59 |
| MM | | 254.90 | 314.84 | 319.87 | 319.87 |
| AC-FT | | 4130. | 5101. | 5182. | 5182. |
| THOUS CU M | | 5094. | 6292. | 6392. | 6392. |

STATION 3, PLAN 1, RTIO 3

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 2. | 4. | 5. | -1. | -10. | -19. | -20. | -11. | 13. | 47. |
| 79. | 106. | 124. | 134. | 137. | 133. | 125. | 115. | 103. | 90. |
| 79. | 68. | 58. | 49. | 42. | 35. | 30. | 26. | 22. | 19. |
| 17. | 15. | 12. | 6. | -1. | -7. | -9. | -2. | 18. | 50. |
| 90. | 137. | 193. | 242. | 278. | 289. | 280. | 265. | 279. | 358. |
| 513. | 671. | 897. | 1245. | 1764. | 2479. | 3383. | 4384. | 5332. | 6101. |
| 6601. | 6801. | 6723. | 6428. | 5982. | 5451. | 4882. | 4335. | 3813. | 3335. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 6801. | 5552. | 1714. | 836. | 83609. |
| CMS | 193. | 157. | 49. | 24. | 2368. |
| INCHES | | 6.69 | 8.26 | 8.40 | 8.40 |
| MM | | 169.93 | 209.90 | 213.25 | 213.25 |
| AC-FT | | 2753. | 3401. | 3455. | 3455. |
| THOUS CU M | | 3396. | 4195. | 4262. | 4262. |

STATION 3, PLAN 1, RTIO 4

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |

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```
      1.      1.      1.      1.      1.      1.      1.      1.      1.      1.
      1.      2.      3.     -0.     -5.     -9.    -10.     -5.      7.     23.
     40.     53.     62.     67.     68.     67.     63.     57.     51.     45.
     39.     34.     29.     25.     21.     18.     15.     13.     11.      9.
      8.      8.      6.      3.     -0.     -4.     -5.     -1.      9.     25.
     45.     68.     95.    121.    139.    145.    140.    134.    139.    184.
    256.    336.    449.    623.    882.   1239.   1692.   2192.   2666.   3051.
   3301.   3403.   3361.   3214.   2991.   2726.   2445.   2168.   1937.   1658.

                        PEAK   6-HOUR  24-HOUR  72-HOUR  TOTAL VOLUME
               CFS     3400.    2776.     857.     418.        41805.
               CMS       96.      79.      24.      12.         1184.
            INCHES               3.35     4.13     4.20          4.20
                MM              84.97   104.95   106.62        106.62
             AC-FT              1377.    1700.    1727.         1727.
        THOUS CU M              1698.    2097.    2131.         2131.


     **********        **********        **********        **********        **********

                          SUB-AREA RUNOFF COMPUTATION

          B SUB-BASIN (4) RUNOFF

               ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                   3       0       0       0       0       0       1       0       0

                                   HYDROGRAPH DATA
        IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
            1       1    1.62    0.00   15.24    0.00   0.000       0       1       0

                                   PRECIP DATA
               SPFE     PMS      R6     R12     R24     R48     R72     R96
               0.00   22.50  109.00  120.00  122.00  140.00    0.00    0.00
  TRSPC COMPUTED BY THE PROGRAM IS  .814

                                   LOSS DATA
      LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
          0    0.00    0.00    1.00    0.00    0.00    1.00    2.00     .10    0.00     .02

                             UNIT HYDROGRAPH DATA
                        TP=  3.00     CP= .63    NTA=  0

                                  RECESSION DATA
                   STRTQ=    -.50    QRCSN=    -.05    RTIOR= 1.60
  APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.85 AND R= 5.33 INTERVALS

         UNIT HYDROGRAPH 32 END-OF-PERIOD ORDINATES, LAG=   2.99 HOURS, CP=  .63  VOL= 1.00
     14.     52.    102.    156.    199.    222.    220.    193.    160.    133.
    110.     91.     75.     62.     52.     43.     35.     29.     24.     20.
     17.     14.     11.      9.      8.      7.      5.      4.      4.      3.
      3.      2.

                                 END-OF-PERIOD FLOW
  MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q     MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q

   1.01    .30       1    .00    .00    .00       1.      1.02   1.30      51    .05    .00    .05       4.
```

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.01 | 1.00 | 2 | .00 | .00 | .00 | 1. | 1.02 | 2.00 | 52 | .05 | .00 | .05 | 3. |
| 1.01 | 1.30 | 3 | .00 | .00 | .00 | 1. | 1.02 | 2.30 | 53 | .05 | .00 | .05 | 3. |
| 1.01 | 2.00 | 4 | .00 | .00 | .00 | 1. | 1.02 | 3.00 | 54 | .05 | .00 | .05 | 3. |
| 1.01 | 2.30 | 5 | .00 | .00 | .00 | 1. | 1.02 | 3.30 | 55 | .05 | .00 | .05 | 3. |
| 1.01 | 3.00 | 6 | .00 | .00 | .00 | 1. | 1.02 | 4.00 | 56 | .05 | .00 | .05 | 3. |
| 1.01 | 3.30 | 7 | .00 | .00 | .00 | 1. | 1.02 | 4.30 | 57 | .05 | .00 | .05 | 2. |
| 1.01 | 4.00 | 8 | .00 | .00 | .00 | 1. | 1.02 | 5.00 | 58 | .05 | .00 | .05 | 2. |
| 1.01 | 4.30 | 9 | .00 | .00 | .00 | 1. | 1.02 | 5.30 | 59 | .05 | .00 | .05 | 2. |
| 1.01 | 5.00 | 10 | .00 | .00 | .00 | 1. | 1.02 | 6.00 | 60 | .05 | .00 | .05 | 2. |
| 1.01 | 5.30 | 11 | .00 | .00 | .00 | 1. | 1.02 | 6.30 | 61 | .17 | .12 | .05 | 4. |
| 1.01 | 6.00 | 12 | .00 | .00 | .00 | 1. | 1.02 | 7.00 | 62 | .17 | .12 | .05 | 10. |
| 1.01 | 6.30 | 13 | .02 | .00 | .02 | 1. | 1.02 | 7.30 | 63 | .17 | .12 | .05 | 22. |
| 1.01 | 7.00 | 14 | .02 | .00 | .02 | 1. | 1.02 | 8.00 | 64 | .17 | .12 | .05 | 40. |
| 1.01 | 7.30 | 15 | .02 | .00 | .02 | 1. | 1.02 | 8.30 | 65 | .17 | .12 | .05 | 64. |
| 1.01 | 8.00 | 16 | .02 | .00 | .02 | 1. | 1.02 | 9.00 | 66 | .17 | .12 | .05 | 90. |
| 1.01 | 8.30 | 17 | .02 | .00 | .02 | 1. | 1.02 | 9.30 | 67 | .17 | .12 | .05 | 116. |
| 1.01 | 9.00 | 18 | .02 | .00 | .02 | 1. | 1.02 | 10.00 | 68 | .17 | .12 | .05 | 138. |
| 1.01 | 9.30 | 19 | .02 | .00 | .02 | 1. | 1.02 | 10.30 | 69 | .17 | .12 | .05 | 157. |
| 1.01 | 10.00 | 20 | .02 | .00 | .02 | 1. | 1.02 | 11.00 | 70 | .17 | .12 | .05 | 173. |
| 1.01 | 10.30 | 21 | .02 | .00 | .02 | 1. | 1.02 | 11.30 | 71 | .17 | .12 | .05 | 186. |
| 1.01 | 11.00 | 22 | .02 | .00 | .02 | 1. | 1.02 | 12.00 | 72 | .17 | .12 | .05 | 197. |
| 1.01 | 11.30 | 23 | .02 | .00 | .02 | 1. | 1.02 | 12.30 | 73 | 1.00 | .95 | .05 | 217. |
| 1.01 | 12.00 | 24 | .02 | .00 | .02 | 1. | 1.02 | 13.00 | 74 | 1.00 | .95 | .05 | 268. |
| 1.01 | 12.30 | 25 | .09 | .00 | .09 | 1. | 1.02 | 13.30 | 75 | 1.20 | 1.15 | .05 | 361. |
| 1.01 | 13.00 | 26 | .09 | .00 | .09 | 1. | 1.02 | 14.00 | 76 | 1.20 | 1.15 | .05 | 506. |
| 1.01 | 13.30 | 27 | .11 | .00 | .11 | 1. | 1.02 | 14.30 | 77 | 1.50 | 1.45 | .05 | 700. |
| 1.01 | 14.00 | 28 | .11 | .00 | .11 | 1. | 1.02 | 15.00 | 78 | 1.50 | 1.45 | .05 | 934. |
| 1.01 | 14.30 | 29 | .14 | .00 | .14 | 2. | 1.02 | 15.30 | 79 | 1.82 | 1.77 | .05 | 1194. |
| 1.01 | 15.00 | 30 | .14 | .00 | .14 | 2. | 1.02 | 16.00 | 80 | 5.77 | 5.72 | .05 | 1520. |
| 1.01 | 15.30 | 31 | .17 | .00 | .17 | 3. | 1.02 | 16.30 | 81 | 1.40 | 1.35 | .05 | 1934. |
| 1.01 | 16.00 | 32 | .54 | .01 | .53 | 3. | 1.02 | 17.00 | 82 | 1.40 | 1.35 | .05 | 2378. |
| 1.01 | 16.30 | 33 | .13 | .00 | .13 | 4. | 1.02 | 17.30 | 83 | 1.10 | 1.05 | .05 | 2797. |
| 1.01 | 17.00 | 34 | .13 | .00 | .13 | 5. | 1.02 | 18.00 | 84 | 1.10 | 1.05 | .05 | 3120. |
| 1.01 | 17.30 | 35 | .10 | .01 | .09 | 6. | 1.02 | 18.30 | 85 | .07 | .02 | .05 | 3256. |
| 1.01 | 18.00 | 36 | .10 | .05 | .05 | 7. | 1.02 | 19.00 | 86 | .07 | .02 | .05 | 3257. |
| 1.01 | 18.30 | 37 | .01 | .00 | .01 | 10. | 1.02 | 19.30 | 87 | .07 | .02 | .05 | 3039. |
| 1.01 | 19.00 | 38 | .01 | .00 | .01 | 13. | 1.02 | 20.00 | 88 | .07 | .02 | .05 | 2719. |
| 1.01 | 19.30 | 39 | .01 | .00 | .01 | 15. | 1.02 | 20.30 | 89 | .07 | .02 | .05 | 2371. |
| 1.01 | 20.00 | 40 | .01 | .00 | .01 | 17. | 1.02 | 21.00 | 90 | .07 | .02 | .05 | 2021. |
| 1.01 | 20.30 | 41 | .01 | .00 | .01 | 18. | 1.02 | 21.30 | 91 | .07 | .02 | .05 | 1695. |
| 1.01 | 21.00 | 42 | .01 | .00 | .01 | 17. | 1.02 | 22.00 | 92 | .07 | .02 | .05 | 1412. |
| 1.01 | 21.30 | 43 | .01 | .00 | .01 | 15. | 1.02 | 22.30 | 93 | .07 | .02 | .05 | 1178. |
| 1.01 | 22.00 | 44 | .01 | .00 | .01 | 12. | 1.02 | 23.00 | 94 | .07 | .02 | .05 | 985. |
| 1.01 | 22.30 | 45 | .01 | .00 | .01 | 10. | 1.02 | 23.30 | 95 | .07 | .02 | .05 | 824. |
| 1.01 | 23.00 | 46 | .01 | .00 | .01 | 8. | 1.03 | 0.00 | 96 | .07 | .02 | .05 | 691. |
| 1.01 | 23.30 | 47 | .01 | .00 | .01 | 7. | 1.03 | .30 | 97 | 0.00 | 0.00 | 0.00 | 551. |
| 1.02 | 0.00 | 48 | .01 | .00 | .01 | 6. | 1.03 | 1.00 | 98 | 0.00 | 0.00 | 0.00 | 488. |
| 1.02 | .30 | 49 | .05 | .00 | .05 | 5. | 1.03 | 1.30 | 99 | 0.00 | 0.00 | 0.00 | 410. |
| 1.02 | 1.00 | 50 | .05 | .00 | .05 | 4. | 1.03 | 2.00 | 100 | 0.00 | 0.00 | 0.00 | 344. |

SUM 25.65 21.22 4.43 42671.
( 652.)( 539.)( 113.)( 1205.31)

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 3286. | 2507. | 881. | 425. | 42492. |
| CMS | 93. | 71. | 25. | 12. | 1203. |
| INCHES | | 14.39 | 20.23 | 20.33 | 20.33 |
| MM | | 365.63 | 513.85 | 516.46 | 516.46 |
| AC-FT | | 1243. | 1747. | 1756. | 1756. |
| THOUS CU M | | 1533. | 2155. | 2166. | 2166. |

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HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. |
| 3. | 3. | 4. | 5. | 6. | 7. | 10. | 13. | 15. | 17. |
| 18. | 17. | 15. | 12. | 10. | 8. | 7. | 6. | 5. | 4. |
| 4. | 3. | 3. | 3. | 3. | 3. | 2. | 2. | 2. | 2. |
| 4. | 10. | 22. | 40. | 64. | 90. | 116. | 138. | 157. | 173. |
| 186. | 197. | 217. | 268. | 361. | 506. | 700. | 934. | 1194. | 1520. |
| 1934. | 2378. | 2797. | 3120. | 3286. | 3257. | 3039. | 2719. | 2371. | 2021. |
| 1695. | 1412. | 1176. | 985. | 824. | 691. | 581. | 488. | 410. | 344. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 3286. | 2507. | 881. | 425. | 42492. |
| CMS | 93. | 71. | 25. | 12. | 1203. |
| INCHES | | 14.39 | 20.23 | 20.33 | 20.33 |
| MM | | 365.63 | 513.85 | 516.46 | 516.46 |
| AC-FT | | 1243. | 1747. | 1756. | 1756. |
| THOUS CU M | | 1533. | 2155. | 2166. | 2166. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. |
| 2. | 2. | 3. | 4. | 4. | 5. | 7. | 10. | 12. | 13. |
| 13. | 13. | 11. | 9. | 8. | 6. | 5. | 4. | 4. | 3. |
| 3. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 3. | 7. | 15. | 30. | 48. | 67. | 87. | 104. | 118. | 130. |
| 140. | 148. | 163. | 201. | 271. | 379. | 525. | 701. | 896. | 1140. |
| 1450. | 1783. | 2098. | 2340. | 2464. | 2443. | 2279. | 2039. | 1778. | 1516. |
| 1271. | 1059. | 884. | 739. | 618. | 518. | 436. | 366. | 308. | 258. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 2464. | 1880. | 661. | 319. | 31869. |
| CMS | 70. | 53. | 19. | 9. | 902. |
| INCHES | | 10.80 | 15.17 | 15.25 | 15.25 |
| MM | | 274.22 | 385.39 | 387.34 | 387.34 |
| AC-FT | | 932. | 1310. | 1317. | 1317. |
| THOUS CU M | | 1150. | 1616. | 1624. | 1624. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 1. | 1. | 1. | 1. |
| 1. | 2. | 2. | 2. | 3. | 4. | 5. | 6. | 8. | 9. |
| 9. | 8. | 7. | 6. | 5. | 4. | 4. | 3. | 2. | 2. |
| 2. | 2. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 2. | 5. | 11. | 20. | 32. | 45. | 59. | 69. | 79. | 87. |
| 93. | 98. | 109. | 134. | 181. | 253. | 350. | 467. | 597. | 760. |
| 967. | 1189. | 1393. | 1560. | 1643. | 1629. | 1519. | 1359. | 1186. | 1011. |
| 847. | 706. | 569. | 492. | 412. | 346. | 290. | 244. | 205. | 172. |

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME

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| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 1643. | 1253. | 440. | 212. | 21246. |
| CMS | 47. | 35. | 12. | 6. | 602. |
| INCHES | | 7.20 | 10.12 | 10.17 | 10.17 |
| MM | | 182.81 | 256.93 | 258.23 | 258.23 |
| AC-FT | | 622. | 874. | 878. | 878. |
| THOUS CU M | | 767. | 1077. | 1083. | 1083. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 1. |
| 1. | 1. | 1. | 1. | 1. | 2. | 2. | 3. | 4. | 4. |
| 4. | 4. | 4. | 3. | 3. | 2. | 2. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 2. | 5. | 10. | 16. | 22. | 29. | 35. | 39. | 43. |
| 47. | 49. | 54. | 67. | 90. | 126. | 175. | 234. | 299. | 380. |
| 483. | 594. | 699. | 780. | 821. | 814. | 760. | 680. | 593. | 505. |
| 424. | 353. | 295. | 246. | 206. | 173. | 145. | 122. | 103. | 86. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 821. | 627. | 220. | 106. | 10623. |
| CMS | 23. | 18. | 6. | 3. | 301. |
| INCHES | | 3.60 | 5.06 | 5.08 | 5.08 |
| MM | | 91.41 | 128.46 | 129.11 | 129.11 |
| AC-FT | | 311. | 437. | 439. | 439. |
| THOUS CU M | | 383. | 539. | 541. | 541. |

**********  **********  **********  **********  **********

COMBINE HYDROGRAPHS

9 COMBINE 2 HYDROGRAPHS AT NODE 103

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|---|---|---|---|---|---|---|---|---|
| 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4. | 4. | 4. | 4. | 4. | 4. | 4. | 4. | 4. | 4. |
| 4. | 4. | 4. | 4. | 4. | 3. | 3. | 3. | 3. | 3. |
| 3. | 3. | 3. | 3. | 3. | 4. | 4. | 4. | 4. | 5. |
| 6. | 12. | 14. | 4. | -15. | -31. | -31. | -9. | 42. | 111. |
| 177. | 228. | 263. | 280. | 284. | 275. | 258. | 235. | 210. | 185. |
| 161. | 139. | 119. | 101. | 86. | 73. | 63. | 54. | 46. | 40. |
| 36. | 41. | 46. | 53. | 62. | 73. | 97. | 135. | 194. | 272. |
| 357. | 470. | 597. | 752. | 917. | 1085. | 1260. | 1470. | 1751. | 2256. |
| 2959. | 3720. | 4590. | 5610. | 6514. | 8215. | 9836. | 11488. | 13036. | 14223. |
| 14697. | 15014. | 14624. | 13840. | 12788. | 11593. | 10360. | 9159. | 8036. | 7014. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 15014. | 12530. | 4310. | 2097. | 209710. |
| CMS | 425. | 355. | 122. | 59. | 5938. |
| INCHES | | 12.46 | 17.17 | 17.41 | 17.41 |
| MM | | 316.97 | 436.11 | 442.10 | 442.10 |

Sheet 29 of 57

| | | | | | |
|---|---|---|---|---|---|
| AC-FT | | 6213. | 8548. | 8666. | 8666. |
| THOUS CU M | | 7664. | 10544. | 10689. | 10689. |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. |
| 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 2. | 2. |
| 2. | 2. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 4. |
| 4. | 9. | 11. | 3. | -11. | -23. | -23. | -7. | 31. | 83. |
| 132. | 171. | 197. | 210. | 213. | 206. | 194. | 177. | 158. | 139. |
| 121. | 104. | 59. | 76. | 65. | 55. | 47. | 40. | 34. | 30. |
| 26. | 31. | 35. | 40. | 47. | 56. | 73. | 102. | 145. | 204. |
| 275. | 353. | 448. | 564. | 698. | 813. | 945. | 1102. | 1314. | 1692. |
| 2219. | 2790. | 3443. | 4208. | 5110. | 6161. | 7354. | 8616. | 9777. | 10668. |
| 11173. | 11263. | 10968. | 10330. | 9591. | 8695. | 7770. | 6869. | 6027. | 5260. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 11260. | 9397. | 3232. | 1573. | 157283. |
| CMS | 319. | 266. | 92. | 45. | 4454. |
| INCHES | | 9.36 | 12.88 | 13.05 | 13.05 |
| MM | | 237.73 | 327.08 | 331.57 | 331.57 |
| AC-FT | | 4660. | 6411. | 6499. | 6499. |
| THOUS CU M | | 5748. | 7908. | 8017. | 8017. |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 3. | 6. | 7. | 2. | -7. | -15. | -16. | -5. | 21. | 55. |
| 88. | 114. | 131. | 140. | 142. | 138. | 129. | 118. | 105. | 92. |
| 80. | 69. | 59. | 51. | 43. | 37. | 31. | 27. | 23. | 20. |
| 19. | 20. | 23. | 26. | 31. | 37. | 49. | 68. | 97. | 136. |
| 183. | 235. | 293. | 376. | 459. | 542. | 630. | 735. | 876. | 1128. |
| 1460. | 1860. | 2295. | 2805. | 3407. | 4107. | 4903. | 5744. | 6518. | 7112. |
| 7443. | 7507. | 7312. | 6920. | 6394. | 5797. | 5180. | 4580. | 4018. | 3507. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 7507. | 6265. | 2155. | 1049. | 104855. |
| CMS | 213. | 177. | 61. | 30. | 2969. |
| INCHES | | 6.24 | 8.58 | 8.70 | 8.70 |
| MM | | 158.48 | 218.05 | 221.05 | 221.05 |
| AC-FT | | 3107. | 4274. | 4333. | 4333. |
| THOUS CU M | | 3832. | 5272. | 5345. | 5345. |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 3. | 4. | 1. | -4. | -8. | -9. | -2. | 40. | 28. |
| 44. | 57. | 66. | 70. | 71. | 69. | 65. | 59. | 53. | 46. |
| 40. | 35. | 30. | 25. | 22. | 18. | 16. | 13. | 11. | 10. |
| 9. | 10. | 12. | 13. | 16. | 19. | 24. | 34. | 48. | 68. |

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```
      92.      118.      149.      188.      229.      271.      315.      367.      438.      564.
     740.      930.     1148.     1403.     1703.     2054.     2451.     2872.     3259.     3556.
    3724.     3753.     3656.     3460.     3197.     2898.     2590.     2290.     2009.     1753.

                          PEAK    6-HOUR   24-HOUR   72-HOUR   TOTAL VOLUME
                 CFS     3753.     3132.     1077.      524.       52428.
                 CMS      106.       89.       31.       15.        1485.
              INCHES                3.12      4.29      4.35         4.35
                  MM               79.24    109.03    110.52       110.52
               AC-FT                1553.     2137.     2166.        2166.
          THOUS CU M                1916.     2636.     2672.        2672.

 **********          **********          **********          **********          **********

                                  SUB-AREA RUNOFF COMPUTATION

             10 SUB-BASIN (5) RUNOFF

                      ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                          3       0       0       0       0       0       1       0       0

                                          HYDROGRAPH DATA
           IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
               1       1    1.36    0.00   15.24    0.00   0.000       0       1       0

                                            PRECIP DATA
                  SPFE     PMS      R6     R12     R24     R48     R72     R96
                  0.00   22.50  109.00  120.00  128.00  140.00    0.00    0.00
 TRSPC COMPUTED BY THE PROGRAM IS  .814

                                            LOSS DATA
      LROPT   STRKR   DLTKP   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
          0    0.00    0.00    1.00    0.00    0.00    1.00    2.00     .10    0.00     .02

                                      UNIT HYDROGRAPH DATA
                                  TP=  2.00     CP= .63     NTA=  0

                                          RECESSION DATA
                            STRTQ=    -.50     QRCSN=    -.05     RTIOR= 1.60
 APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 4.79 AND R= 3.37 INTERVALS

       UNIT HYDROGRAPH 21 END-OF-PERIOD ORDINATES, LAG=   1.98 HOURS, CP=  .63   VOL= 1.00
      31.      109.      204.      270.      273.      224.      166.      123.       91.       68.
      50.       37.       28.       21.       15.       11.        8.        6.        5.        3.
       3.

     0                                    END-OF-PERIOD FLOW
   MO.DA   HR.MN  PERIOD    RAIN    EXCS    LOSS    COMP Q     MO.DA   HR.MN  PERIOD    RAIN    EXCS    LOSS    COMP Q

    1.01     .30       1     .00     .00     .00        1.      1.02    1.30      51     .05     .00     .05        1.
    1.01    1.00       2     .00     .00     .00        1.      1.02    2.00      52     .05     .00     .05        1.
    1.01    1.30       3     .00     .00     .00        1.      1.02    2.30      53     .05     .00     .05        1.
    1.01    2.00       4     .00     .00     .00        1.      1.02    3.00      54     .05     .00     .05        2.
    1.01    2.30       5     .00     .00     .00        1.      1.02    3.30      55     .05     .00     .05        2.
    1.01    3.00       6     .00     .00     .00        1.      1.02    4.00      56     .05     .00     .05        2.
    1.01    3.30       7     .00     .00     .00        1.      1.02    4.30      57     .05     .00     .05        2.
```

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.01 | 4.00 | 8 | .00 | .00 | .00 | 1. | 1.02 | 5.00 | 58 | .05 | .00 | .05 | 2. |
| 1.01 | 4.30 | 9 | .00 | .00 | .00 | 1. | 1.02 | 5.30 | 59 | .05 | .00 | .05 | 2. |
| 1.01 | 5.00 | 10 | .00 | .00 | .00 | 1. | 1.02 | 6.00 | 60 | .05 | .00 | .05 | 2. |
| 1.01 | 5.30 | 11 | .00 | .00 | .00 | 1. | 1.02 | 6.30 | 61 | .17 | .12 | .05 | 5. |
| 1.01 | 6.00 | 12 | .00 | .00 | .00 | 1. | 1.02 | 7.00 | 62 | .17 | .12 | .05 | 18. |
| 1.01 | 6.30 | 13 | .02 | .00 | .02 | 1. | 1.02 | 7.30 | 63 | .17 | .12 | .05 | 42. |
| 1.01 | 7.00 | 14 | .02 | .00 | .02 | 1. | 1.02 | 8.00 | 64 | .17 | .12 | .05 | 74. |
| 1.01 | 7.30 | 15 | .02 | .00 | .02 | 1. | 1.02 | 8.30 | 65 | .17 | .12 | .05 | 106. |
| 1.01 | 8.00 | 16 | .02 | .00 | .02 | 1. | 1.02 | 9.00 | 66 | .17 | .12 | .05 | 133. |
| 1.01 | 8.30 | 17 | .02 | .00 | .02 | 1. | 1.02 | 9.30 | 67 | .17 | .12 | .05 | 152. |
| 1.01 | 9.00 | 18 | .02 | .00 | .02 | 1. | 1.02 | 10.00 | 68 | .17 | .12 | .05 | 167. |
| 1.01 | 9.30 | 19 | .02 | .00 | .02 | 1. | 1.02 | 10.30 | 69 | .17 | .12 | .05 | 178. |
| 1.01 | 10.00 | 20 | .02 | .00 | .02 | 1. | 1.02 | 11.00 | 70 | .17 | .12 | .05 | 156. |
| 1.01 | 10.30 | 21 | .02 | .00 | .02 | 1. | 1.02 | 11.30 | 71 | .17 | .12 | .05 | 192. |
| 1.01 | 11.00 | 22 | .02 | .00 | .02 | 1. | 1.02 | 12.00 | 72 | .17 | .12 | .05 | 196. |
| 1.01 | 11.30 | 23 | .02 | .00 | .02 | 1. | 1.02 | 12.30 | 73 | 1.00 | .95 | .05 | 225. |
| 1.01 | 12.00 | 24 | .02 | .00 | .02 | 1. | 1.02 | 13.00 | 74 | 1.00 | .95 | .05 | 318. |
| 1.01 | 12.30 | 25 | .09 | .00 | .09 | 1. | 1.02 | 13.30 | 75 | 1.20 | 1.15 | .05 | 495. |
| 1.01 | 13.00 | 26 | .09 | .00 | .09 | 1. | 1.02 | 14.00 | 76 | 1.20 | 1.15 | .05 | 742. |
| 1.01 | 13.30 | 27 | .11 | .00 | .11 | 1. | 1.02 | 14.30 | 77 | 1.50 | 1.45 | .05 | 1020. |
| 1.01 | 14.00 | 28 | .11 | .00 | .11 | 2. | 1.02 | 15.00 | 78 | 1.50 | 1.45 | .05 | 1293. |
| 1.01 | 14.30 | 29 | .14 | .00 | .14 | 2. | 1.02 | 15.30 | 79 | 1.82 | 1.77 | .05 | 1558. |
| 1.01 | 15.00 | 30 | .14 | .00 | .14 | 3. | 1.02 | 16.00 | 80 | 5.77 | 5.72 | .05 | 1942. |
| 1.01 | 15.30 | 31 | .17 | .00 | .17 | 3. | 1.02 | 16.30 | 81 | 1.40 | 1.35 | .05 | 2496. |
| 1.01 | 16.00 | 32 | .54 | .01 | .53 | 4. | 1.02 | 17.00 | 82 | 1.40 | 1.35 | .05 | 3059. |
| 1.01 | 16.30 | 33 | .13 | .00 | .13 | 5. | 1.02 | 17.30 | 83 | 1.10 | 1.05 | .05 | 3422. |
| 1.01 | 17.00 | 34 | .13 | .00 | .13 | 6. | 1.02 | 18.00 | 84 | 1.10 | 1.05 | .05 | 3444. |
| 1.01 | 17.30 | 35 | .10 | .01 | .09 | 7. | 1.02 | 18.30 | 85 | .07 | .02 | .05 | 3157. |
| 1.01 | 18.00 | 36 | .10 | .05 | .05 | 9. | 1.02 | 19.00 | 86 | .07 | .02 | .05 | 2725. |
| 1.01 | 18.30 | 37 | .01 | .00 | .01 | 13. | 1.02 | 19.30 | 87 | .07 | .02 | .05 | 2257. |
| 1.01 | 19.00 | 38 | .01 | .00 | .01 | 15. | 1.02 | 20.00 | 88 | .07 | .02 | .05 | 1792. |
| 1.01 | 19.30 | 39 | .01 | .00 | .01 | 20. | 1.02 | 20.30 | 89 | .07 | .02 | .05 | 1355. |
| 1.01 | 20.00 | 40 | .01 | .00 | .01 | 19. | 1.02 | 21.00 | 90 | .07 | .02 | .05 | 1015. |
| 1.01 | 20.30 | 41 | .01 | .00 | .01 | 16. | 1.02 | 21.30 | 91 | .07 | .02 | .05 | 764. |
| 1.01 | 21.00 | 42 | .01 | .00 | .01 | 12. | 1.02 | 22.00 | 92 | .07 | .02 | .05 | 577. |
| 1.01 | 21.30 | 43 | .01 | .00 | .01 | 9. | 1.02 | 22.30 | 93 | .07 | .02 | .05 | 439. |
| 1.01 | 22.00 | 44 | .01 | .00 | .01 | 7. | 1.02 | 23.00 | 94 | .07 | .02 | .05 | 335. |
| 1.01 | 22.30 | 45 | .01 | .00 | .01 | 5. | 1.02 | 23.30 | 95 | .07 | .02 | .05 | 257. |
| 1.01 | 23.00 | 46 | .01 | .00 | .01 | 4. | 1.03 | 0.00 | 96 | .07 | .02 | .05 | 200. |
| 1.01 | 23.30 | 47 | .01 | .00 | .01 | 3. | 1.03 | .30 | 97 | 0.00 | 0.00 | 0.00 | 169. |
| 1.02 | 0.00 | 48 | .01 | .00 | .01 | 2. | 1.03 | 1.00 | 98 | 0.00 | 0.00 | 0.00 | 162. |
| 1.02 | .30 | 49 | .05 | .00 | .05 | 2. | 1.03 | 1.30 | 99 | 0.00 | 0.00 | 0.00 | 154. |
| 1.02 | 1.00 | 50 | .05 | .00 | .05 | 1. | 1.03 | 2.00 | 100 | 0.00 | 0.00 | 0.00 | 147. |
| | | | | | | | | | SUM | 25.65 | 21.22 | 4.43 | 37174. |
| | | | | | | | | | | ( 652.) | ( 539.) | ( 113.) | ( 1052.65) |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 3444. | 2353. | 769. | 371. | 37088. |
| CMS | 98. | 67. | 22. | 11. | 1050. |
| INCHES | | 16.16 | 21.03 | 21.14 | 21.14 |
| MM | | 410.47 | 534.19 | 536.95 | 536.95 |
| AC-FT | | 1172. | 1525. | 1533. | 1533. |
| THOUS CU M | | 1445. | 1881. | 1890. | 1890. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 1

1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
1. 1. 1. 1. 1. 1. 1. 1. 1. 1.

Sheet 32 of 57

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. | 3. |
| 3. | 4. | 5. | 6. | 7. | 9. | 13. | 18. | 20. | 19. |
| 16. | 12. | 9. | 7. | 5. | 4. | 3. | 2. | 2. | 1. |
| 1. | 1. | 1. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 5. | 18. | 42. | 74. | 106. | 133. | 152. | 167. | 178. | 186. |
| 192. | 196. | 225. | 318. | 495. | 742. | 1020. | 1293. | 1558. | 1962. |
| 2496. | 3059. | 3422. | 3444. | 3157. | 2725. | 2257. | 1782. | 1355. | 1015. |
| 764. | 577. | 439. | 335. | 257. | 200. | 169. | 162. | 154. | 147. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 3444. | 2363. | 769. | 371. | 37088. |
| CMS | 98. | 67. | 22. | 11. | 1050. |
| INCHES | | 16.16 | 21.03 | 21.14 | 21.14 |
| MM | | 410.47 | 534.19 | 536.95 | 536.95 |
| AC-FT | | 1172. | 1525. | 1533. | 1533. |
| THOUS CU M | | 1445. | 1881. | 1890. | 1890. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. |
| 2. | 3. | 4. | 5. | 5. | 7. | 10. | 13. | 15. | 14. |
| 12. | 9. | 7. | 5. | 4. | 3. | 2. | 2. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 4. | 14. | 32. | 56. | 80. | 100. | 114. | 125. | 133. | 139. |
| 144. | 147. | 169. | 238. | 371. | 556. | 765. | 970. | 1168. | 1456. |
| 1872. | 2294. | 2567. | 2583. | 2368. | 2044. | 1693. | 1337. | 1016. | 751. |
| 573. | 433. | 329. | 251. | 193. | 150. | 127. | 121. | 116. | 110. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 2583. | 1772. | 577. | 278. | 27816. |
| CMS | 73. | 50. | 16. | 8. | 788. |
| INCHES | | 12.12 | 15.77 | 15.85 | 15.85 |
| MM | | 307.85 | 400.64 | 402.71 | 402.71 |
| AC-FT | | 879. | 1143. | 1149. | 1149. |
| THOUS CU M | | 1084. | 1410. | 1418. | 1418. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 1. | 1. | 1. | 1. |
| 2. | 2. | 2. | 3. | 3. | 5. | 7. | 9. | 10. | 10. |
| 8. | 6. | 4. | 3. | 2. | 2. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 3. | 9. | 21. | 37. | 53. | 66. | 76. | 83. | 89. | 93. |
| 96. | 98. | 112. | 159. | 247. | 371. | 510. | 647. | 779. | 971. |
| 1248. | 1529. | 1711. | 1722. | 1579. | 1363. | 1129. | 891. | 677. | 538. |
| 382. | 289. | 219. | 167. | 129. | 100. | 85. | 81. | 77. | 74. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 1722. | 1181. | 384. | 185. | 18544. |
| CMS | 49. | 33. | 11. | 5. | 525. |
| INCHES | | 8.08 | 10.52 | 10.57 | 10.57 |
| MM | | 205.24 | 267.09 | 268.47 | 268.47 |
| AC-FT | | 586. | 762. | 766. | 766. |
| THOUS CU M | | 723. | 940. | 945. | 945. |

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HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 1. | 1. |
| 1. | 1. | 1. | 2. | 2. | 2. | 3. | 4. | 5. | 5. |
| 4. | 3. | 2. | 2. | 1. | 1. | 1. | 1. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 1. | 5. | 11. | 19. | 27. | 33. | 38. | 42. | 44. | 46. |
| 48. | 49. | 56. | 79. | 124. | 185. | 255. | 323. | 389. | 495. |
| 624. | 765. | 856. | 861. | 789. | 681. | 564. | 446. | 339. | 254. |
| 191. | 144. | 110. | 84. | 64. | 50. | 42. | 40. | 39. | 37. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 861. | 591. | 192. | 93. | 9272. |
| CMS | 24. | 17. | 5. | 3. | 263. |
| INCHES | | 4.04 | 5.26 | 5.28 | 5.28 |
| MM | | 102.62 | 133.55 | 134.24 | 134.24 |
| AC-FT | | 293. | 381. | 383. | 383. |
| THOUS CU M | | 361. | 470. | 473. | 473. |

**********    **********    **********    **********    **********

COMBINE HYDROGRAPHS

11 COMBINE RUNOFF FROM 5 WITH 2 COMBINED HYDROGRAPHS

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|---|---|---|---|---|---|---|---|---|
| 3 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5. | 5. | 5. | 5. | 5. | 5. | 5. | 5. | 5. | 5. |
| 4. | 4. | 4. | 4. | 4. | 4. | 4. | 4. | 4. | 4. |
| 4. | 4. | 4. | 4. | 4. | 5. | 5. | 6. | 7. | 7. |
| 9. | 16. | 19. | 10. | -8. | -22. | -18. | 9. | 62. | 130. |
| 198. | 240. | 272. | 287. | 289. | 279. | 261. | 238. | 212. | 136. |
| 162. | 140. | 120. | 103. | 88. | 75. | 64. | 55. | 48. | 41. |
| 43. | 59. | 89. | 127. | 158. | 208. | 250. | 302. | 371. | 458. |
| 558. | 666. | 821. | 1070. | 1412. | 1826. | 2280. | 2763. | 3309. | 4198. |
| 5455. | 6779. | 8012. | 9055. | 9971. | 10940. | 12063. | 13270. | 14391. | 15239. |
| 15660. | 15591. | 15063. | 14174. | 13045. | 11793. | 10529. | 9321. | 8191. | 7161. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 15660. | 13457. | 5078. | 2468. | 246798. |
| CMS | 443. | 381. | 144. | 70. | 6989. |
| INCHES | | 11.70 | 17.66 | 17.88 | 17.88 |
| MM | | 297.15 | 448.57 | 454.15 | 454.15 |
| AC-FT | | 6673. | 10073. | 10198. | 10198. |
| THOUS CU M | | 8231. | 12425. | 12579. | 12579. |

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SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4. | 4. | 4. | 4. | 4. | 4. | 4. | 4. | 3. | 3. |
| 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. |
| 3. | 3. | 3. | 3. | 3. | 3. | 4. | 4. | 5. | 6. |
| 7. | 12. | 14. | 7. | -6. | -16. | -13. | 7. | 47. | 98. |
| 144. | 180. | 204. | 215. | 216. | 209. | 196. | 178. | 159. | 140. |
| 122. | 105. | 90. | 77. | 66. | 56. | 48. | 41. | 36. | 31. |
| 32. | 44. | 67. | 95. | 126. | 156. | 187. | 227. | 279. | 344. |
| 419. | 500. | 616. | 802. | 1059. | 1370. | 1710. | 2072. | 2482. | 3149. |
| 4091. | 5084. | 6009. | 6791. | 7478. | 8705. | 9047. | 9953. | 10793. | 11429. |
| 11745. | 11693. | 11297. | 10631. | 9784. | 8845. | 7897. | 6990. | 6143. | 5371. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 11745. | 10092. | 3809. | 1951. | 185098. |
| CMS | 333. | 286. | 108. | 52. | 5241. |
| INCHES | | 8.77 | 13.25 | 13.41 | 13.41 |
| MM | | 222.86 | 336.43 | 340.61 | 340.61 |
| AC-FT | | 5005. | 7555. | 7649. | 7649. |
| THOUS CU M | | 6173. | 9319. | 9435. | 9435. |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3. | 3. | 3. | 3. | 3. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 3. | 3. | 3. | 4. |
| 5. | 8. | 10. | 5. | -4. | -11. | -9. | 4. | 31. | 65. |
| 96. | 120. | 136. | 143. | 144. | 139. | 130. | 119. | 106. | 93. |
| 81. | 70. | 60. | 51. | 44. | 38. | 32. | 28. | 24. | 21. |
| 21. | 30. | 44. | 63. | 84. | 104. | 125. | 151. | 186. | 229. |
| 279. | 333. | 411. | 535. | 706. | 913. | 1140. | 1381. | 1655. | 2099. |
| 2728. | 3389. | 4006. | 4527. | 4985. | 5470. | 6032. | 6635. | 7195. | 7619. |
| 7830. | 7795. | 7531. | 7087. | 6523. | 5897. | 5264. | 4660. | 4095. | 3550. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 7830. | 6728. | 2539. | 1234. | 123399. |
| CMS | 222. | 191. | 72. | 35. | 3494. |
| INCHES | | 5.85 | 8.83 | 8.94 | 8.94 |
| MM | | 148.58 | 224.29 | 227.08 | 227.08 |
| AC-FT | | 3336. | 5036. | 5099. | 5099. |
| THOUS CU M | | 4115. | 6212. | 6290. | 6290. |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. |
| 2. | 4. | 5. | 2. | -2. | -5. | -4. | 2. | 16. | 33. |
| 48. | 60. | 68. | 72. | 72. | 70. | 65. | 59. | 53. | 47. |
| 41. | 35. | 30. | 26. | 22. | 19. | 16. | 14. | 12. | 10. |
| 11. | 15. | 22. | 32. | 42. | 52. | 62. | 76. | 93. | 115. |
| 140. | 167. | 205. | 257. | 353. | 457. | 570. | 691. | 827. | 1050. |
| 1364. | 1695. | 2003. | 2264. | 2493. | 2735. | 3016. | 3318. | 3598. | 3810. |
| 3915. | 3893. | 3765. | 3544. | 3261. | 2946. | 2632. | 2330. | 2048. | 1790. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 3915. | 3364. | 1270. | 617. | 61699. |

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```
                 CMS       111.        95.        36.        17.          1747.
              INCHES                 2.92       4.42       4.47           4.47
                  MM                74.29     112.14     113.54         113.54
               AC-FT                1668.      2518.      2550.          2550.
           THOUS CU M               2058.      3106.      3145.          3145.

      **********      **********      **********      **********      **********

                          SUB-AREA RUNOFF COMPUTATION

           12 WEST BRANCH RUNOFF

                  ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                      3       0       0       0       0       0       1       0       0

                                   HYDROGRAPH DATA
             IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
                 1       1    2.77    0.00   15.24    0.00   0.000       0       1       0

                                     PRECIP DATA
                  SPFE     PMS      R6     R12     R24     R48     R72     R96
                  0.00   22.50  109.00  120.00  128.00  140.00    0.00    0.00
 TRSPC COMPUTED BY THE PROGRAM IS  .814

                                      LOSS DATA
          LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
              0    0.00    0.00    1.00    0.00    0.00    1.00    2.00     .10    0.00     .03

                                 UNIT HYDROGRAPH DATA
                             TP=  3.60    CP= .89    NTA=  0

                                    RECESSION DATA
                         STRTQ=    -.50    QRCSN=    -.05    RTIOR= 1.60
 CLARK DID NOT CONVERGE TO GIVEN SNYDER COEFFICIENTS
 APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=12.97 AND R=  .60 INTERVALS

            UNIT HYDROGRAPH 14 END-OF-PERIOD ORDINATES, LAG=   3.56 HOURS, CP=  .78  VOL= 1.00
             47.      139.      217.      274.      321.      362.      393.      395.      367.      329.
            264.      229.      149.       97.

      0                                    END-OF-PERIOD FLOW
      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q     MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS     COMP Q

       1.01    .30      1    .00    .00    .00        1.       1.02   1.30     51    .05    .00    .05         2.
       1.01   1.00      2    .00    .00    .00        1.       1.02   2.00     52    .05    .00    .05         2.
       1.01   1.30      3    .00    .00    .00        1.       1.02   2.30     53    .05    .00    .05         2.
       1.01   2.00      4    .00    .00    .00        1.       1.02   3.00     54    .05    .00    .05         3.
       1.01   2.30      5    .00    .00    .00        1.       1.02   3.30     55    .05    .00    .05         3.
       1.01   3.00      6    .00    .00    .00        1.       1.02   4.00     56    .05    .00    .05         4.
       1.01   3.30      7    .00    .00    .00        1.       1.02   4.30     57    .05    .00    .05         4.
       1.01   4.00      8    .00    .00    .00        1.       1.02   5.00     58    .05    .00    .05         4.
       1.01   4.30      9    .00    .00    .00        1.       1.02   5.30     59    .05    .00    .05         5.
       1.01   5.00     10    .00    .00    .00        1.       1.02   6.00     60    .05    .00    .05         5.
       1.01   5.30     11    .00    .00    .00        1.       1.02   6.30     61    .17    .12    .05        11.
       1.01   6.00     12    .00    .00    .00        1.       1.02   7.00     62    .17    .12    .05        27.
       1.01   6.30     13    .02    .00    .02        1.       1.02   7.30     63    .17    .12    .05        53.
```

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.01 | 7.00 | 14 | .02 | .00 | .02 | 1. | 1.02 | 8.00 | 64 | .17 | .12 | .05 | 85. |
| 1.01 | 7.30 | 15 | .02 | .00 | .02 | 1. | 1.02 | 8.30 | 65 | .17 | .12 | .05 | 123. |
| 1.01 | 8.00 | 16 | .02 | .00 | .02 | 1. | 1.02 | 9.00 | 66 | .17 | .12 | .05 | 166. |
| 1.01 | 8.30 | 17 | .02 | .00 | .02 | 1. | 1.02 | 9.30 | 67 | .17 | .12 | .05 | 212. |
| 1.01 | 9.00 | 18 | .02 | .00 | .02 | 2. | 1.02 | 10.00 | 68 | .17 | .12 | .05 | 259. |
| 1.01 | 9.30 | 19 | .02 | .00 | .02 | 2. | 1.02 | 10.30 | 69 | .17 | .12 | .05 | 302. |
| 1.01 | 10.00 | 20 | .02 | .00 | .02 | 2. | 1.02 | 11.00 | 70 | .17 | .12 | .05 | 341. |
| 1.01 | 10.30 | 21 | .02 | .00 | .02 | 2. | 1.02 | 11.30 | 71 | .17 | .12 | .05 | 374. |
| 1.01 | 11.00 | 22 | .02 | .00 | .02 | 2. | 1.02 | 12.00 | 72 | .17 | .12 | .05 | 401. |
| 1.01 | 11.30 | 23 | .02 | .00 | .02 | 2. | 1.02 | 12.30 | 73 | 1.00 | .95 | .05 | 458. |
| 1.01 | 12.00 | 24 | .02 | .00 | .02 | 2. | 1.02 | 13.00 | 74 | 1.00 | .95 | .05 | 580. |
| 1.01 | 12.30 | 25 | .09 | .00 | .09 | 2. | 1.02 | 13.30 | 75 | 1.20 | 1.15 | .05 | 769. |
| 1.01 | 13.00 | 26 | .09 | .00 | .09 | 3. | 1.02 | 14.00 | 76 | 1.20 | 1.15 | .05 | 1025. |
| 1.01 | 13.30 | 27 | .11 | .00 | .11 | 3. | 1.02 | 14.30 | 77 | 1.50 | 1.45 | .05 | 1349. |
| 1.01 | 14.00 | 28 | .11 | .00 | .11 | 4. | 1.02 | 15.00 | 78 | 1.50 | 1.45 | .05 | 1746. |
| 1.01 | 14.30 | 29 | .14 | .00 | .14 | 5. | 1.02 | 15.30 | 79 | 1.82 | 1.77 | .05 | 2216. |
| 1.01 | 15.00 | 30 | .14 | .00 | .14 | 6. | 1.02 | 16.00 | 80 | 5.77 | 5.72 | .05 | 2928. |
| 1.01 | 15.30 | 31 | .17 | .01 | .17 | 7. | 1.02 | 16.30 | 81 | 1.40 | 1.35 | .05 | 3822. |
| 1.01 | 16.00 | 32 | .54 | .02 | .52 | 9. | 1.02 | 17.00 | 82 | 1.40 | 1.35 | .05 | 4520. |
| 1.01 | 16.30 | 33 | .13 | .00 | .13 | 12. | 1.02 | 17.30 | 83 | 1.10 | 1.05 | .05 | 5272. |
| 1.01 | 17.00 | 34 | .13 | .00 | .13 | 14. | 1.02 | 18.00 | 84 | 1.10 | 1.05 | .05 | 5790. |
| 1.01 | 17.30 | 35 | .10 | .01 | .09 | 16. | 1.02 | 18.30 | 85 | .07 | .02 | .05 | 6118. |
| 1.01 | 18.00 | 36 | .10 | .05 | .05 | 20. | 1.02 | 19.00 | 86 | .07 | .02 | .05 | 6184. |
| 1.01 | 18.30 | 37 | .01 | .00 | .01 | 27. | 1.02 | 19.30 | 87 | .07 | .02 | .05 | 5940. |
| 1.01 | 19.00 | 38 | .01 | .00 | .01 | 31. | 1.02 | 20.00 | 88 | .07 | .02 | .05 | 5460. |
| 1.01 | 19.30 | 39 | .01 | .00 | .01 | 34. | 1.02 | 20.30 | 89 | .07 | .02 | .05 | 4843. |
| 1.01 | 20.00 | 40 | .01 | .00 | .01 | 35. | 1.02 | 21.00 | 90 | .07 | .02 | .05 | 4129. |
| 1.01 | 20.30 | 41 | .01 | .00 | .01 | 35. | 1.02 | 21.30 | 91 | .07 | .02 | .05 | 3330. |
| 1.01 | 21.00 | 42 | .01 | .00 | .01 | 35. | 1.02 | 22.00 | 92 | .07 | .02 | .05 | 2431. |
| 1.01 | 21.30 | 43 | .01 | .00 | .01 | 33. | 1.02 | 22.30 | 93 | .07 | .02 | .05 | 1544. |
| 1.01 | 22.00 | 44 | .01 | .00 | .01 | 29. | 1.02 | 23.00 | 94 | .07 | .02 | .05 | 888. |
| 1.01 | 22.30 | 45 | .01 | .00 | .01 | 24. | 1.02 | 23.30 | 95 | .07 | .02 | .05 | 552. |
| 1.01 | 23.00 | 46 | .01 | .00 | .01 | 19. | 1.03 | 0.00 | 96 | .07 | .02 | .05 | 309. |
| 1.01 | 23.30 | 47 | .01 | .00 | .01 | 15. | 1.03 | .30 | 97 | 0.00 | 0.00 | 0.00 | 294. |
| 1.02 | 0.00 | 48 | .01 | .00 | .01 | 10. | 1.03 | 1.00 | 98 | 0.00 | 0.00 | 0.00 | 281. |
| 1.02 | .30 | 49 | .05 | .00 | .05 | 4. | 1.03 | 1.30 | 99 | 0.00 | 0.00 | 0.00 | 268. |
| 1.02 | 1.00 | 50 | .05 | .00 | .05 | 2. | 1.03 | 2.00 | 100 | 0.00 | 0.00 | 0.00 | 255. |
| | | | | | | | | | SUM | 25.65 | 21.26 | 4.39 | 76256. |
| | | | | | | | | | | ( 652.) | ( 540.) | ( 111.) | ( 2159.33) |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 6184. | 4849. | 1576. | 761. | 76127. |
| CMS | 175. | 137. | 45. | 22. | 2156. |
| INCHES | | 16.28 | 21.17 | 21.30 | 21.30 |
| MM | | 413.62 | 537.81 | 541.13 | 541.13 |
| AC-FT | | 2404. | 3126. | 3146. | 3146. |
| THOUS CU M | | 2966. | 3856. | 3880. | 3880. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 3. | 3. | 4. | 5. | 6. |
| 7. | 9. | 12. | 14. | 16. | 20. | 27. | 31. | 34. | 35. |
| 36. | 35. | 33. | 29. | 24. | 19. | 15. | 10. | 4. | 2. |
| 2. | 2. | 2. | 3. | 3. | 4. | 4. | 4. | 5. | 5. |
| 11. | 27. | 53. | 85. | 123. | 166. | 212. | 259. | 302. | 341. |
| 374. | 401. | 458. | 580. | 769. | 1025. | 1349. | 1746. | 2216. | 2928. |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3822. | 4620. | 5272. | 5790. | 6118. | 6184. | 5940. | 5460. | 4843. | 4129. |
| 3330. | 2431. | 1544. | 888. | 552. | 309. | 294. | 281. | 268. | 256. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 6184. | 4849. | 1576. | 761. | 76127. |
| CMS | 175. | 137. | 45. | 22. | 2156. |
| INCHES | | 16.28 | 21.17 | 21.30 | 21.30 |
| MM | | 413.62 | 537.81 | 541.13 | 541.13 |
| AC-FT | | 2404. | 3126. | 3146. | 3146. |
| THOUS CU M | | 2965. | 3856. | 3880. | 3880. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 2. | 2. | 2. | 2. | 2. | 3. | 3. | 4. |
| 5. | 7. | 9. | 10. | 12. | 15. | 20. | 23. | 25. | 26. |
| 27. | 26. | 25. | 21. | 18. | 14. | 11. | 7. | 3. | 1. |
| 1. | 1. | 2. | 2. | 2. | 3. | 3. | 3. | 4. | 4. |
| 8. | 20. | 40. | 64. | 92. | 124. | 159. | 194. | 226. | 256. |
| 281. | 301. | 343. | 435. | 577. | 769. | 1012. | 1309. | 1662. | 2196. |
| 2867. | 3465. | 3954. | 4342. | 4589. | 4638. | 4455. | 4095. | 3632. | 3097. |
| 2496. | 1823. | 1158. | 666. | 414. | 231. | 221. | 211. | 201. | 192. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 4638. | 3637. | 1182. | 571. | 57096. |
| CMS | 131. | 103. | 33. | 16. | 1617. |
| INCHES | | 12.21 | 15.88 | 15.98 | 15.98 |
| MM | | 310.22 | 403.36 | 405.85 | 405.85 |
| AC-FT | | 1803. | 2345. | 2359. | 2359. |
| THOUS CU M | | 2224. | 2892. | 2910. | 2910. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. | 2. | 3. |
| 4. | 5. | 6. | 7. | 8. | 10. | 13. | 16. | 17. | 17. |
| 18. | 18. | 16. | 14. | 12. | 10. | 7. | 5. | 2. | 1. |
| 1. | 1. | 1. | 1. | 2. | 2. | 2. | 2. | 2. | 3. |
| 5. | 14. | 26. | 43. | 62. | 83. | 106. | 129. | 151. | 170. |
| 127. | 201. | 229. | 290. | 385. | 513. | 675. | 873. | 1108. | 1464. |
| 1911. | 2310. | 2636. | 2895. | 3059. | 3092. | 2970. | 2730. | 2422. | 2065. |
| 1665. | 1216. | 772. | 444. | 276. | 154. | 147. | 140. | 134. | 128. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 3092. | 2425. | 788. | 381. | 38064. |
| CMS | 88. | 69. | 22. | 11. | 1078. |
| INCHES | | 8.14 | 10.59 | 10.65 | 10.65 |
| MM | | 206.81 | 268.91 | 270.57 | 270.57 |
| AC-FT | | 1202. | 1563. | 1573. | 1573. |
| THOUS CU M | | 1483. | 1928. | 1940. | 1940. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 2. | 2. | 3. | 3. | 4. | 5. | 7. | 8. | 8. | 9. |
| 9. | 9. | 8. | 7. | 6. | 5. | 4. | 2. | 1. | 0. |
| 0. | 0. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 3. | 7. | 13. | 21. | 31. | 41. | 53. | 65. | 75. | 85. |
| 94. | 103. | 114. | 145. | 192. | 256. | 337. | 436. | 554. | 732. |
| 956. | 1155. | 1318. | 1447. | 1530. | 1546. | 1485. | 1365. | 1211. | 1032. |
| 833. | 608. | 386. | 222. | 138. | 77. | 74. | 70. | 67. | 64. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 1546. | 1212. | 394. | 190. | 19032. |
| CMS | 44. | 34. | 11. | 5. | 539. |
| INCHES | | 4.07 | 5.29 | 5.33 | 5.33 |
| MM | | 103.41 | 134.45 | 135.28 | 135.28 |
| AC-FT | | 601. | 782. | 786. | 786. |
| THOUS CU M | | 741. | 964. | 970. | 970. |

**********  **********  **********  **********  **********

COMBINE HYDROGRAPHS

13 COMBINE WEST BRANCH FLOW WITH UPPER BASIN FLOW

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|---|---|---|---|---|---|---|---|---|
| 3 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6. | 6. | 6. | 6. | 6. | 6. | 6. | 6. | 6. | 6. |
| 6. | 6. | 5. | 5. | 5. | 5. | 5. | 6. | 6. | 6. |
| 6. | 6. | 6. | 6. | 6. | 7. | 8. | 9. | 11. | 13. |
| 16. | 25. | 31. | 24. | 8. | -1. | 9. | 40. | 96. | 155. |
| 228. | 275. | 304. | 316. | 312. | 298. | 276. | 247. | 216. | 188. |
| 164. | 142. | 122. | 105. | 91. | 79. | 68. | 60. | 52. | 46. |
| 54. | 86. | 141. | 212. | 291. | 373. | 462. | 561. | 673. | 799. |
| 933. | 1068. | 1279. | 1650. | 2182. | 2852. | 3629. | 4509. | 5525. | 7126. |
| 9276. | 11399. | 13284. | 14845. | 16059. | 17124. | 18003. | 18730. | 19234. | 19368. |
| 18990. | 18022. | 16606. | 15062. | 13598. | 12102. | 10823. | 9602. | 8459. | 7417. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 19368. | 17126. | 6655. | 3229. | 322925. |
| CMS | 548. | 485. | 188. | 91. | 9144. |
| INCHES | | 11.83 | 18.38 | 18.58 | 18.59 |
| MM | | 300.41 | 466.92 | 472.04 | 472.04 |
| AC-FT | | 8492. | 13199. | 13344. | 13344. |
| THOUS CU M | | 10475. | 16281. | 16460. | 16460. |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5. | 5. | 5. | 5. | 5. | 5. | 5. | 5. | 4. | 4. |
| 4. | 4. | 4. | 4. | 4. | 4. | 4. | 4. | 4. | 4. |
| 4. | 4. | 5. | 5. | 5. | 5. | 6. | 7. | 8. | 10. |
| 12. | 16. | 23. | 18. | 6. | -1. | 6. | 30. | 72. | 124. |
| 171. | 206. | 228. | 237. | 234. | 224. | 207. | 185. | 162. | 141. |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 123. | 106. | 92. | 79. | 68. | 59. | 51. | 45. | 39. | 35. |
| 40. | 65. | 106. | 159. | 219. | 280. | 346. | 421. | 505. | 599. |
| 700. | 801. | 959. | 1237. | 1636. | 2139. | 2722. | 3382. | 4144. | 5344. |
| 6958. | 8549. | 9963. | 11133. | 12067. | 12843. | 13503. | 14048. | 14425. | 14526. |
| 14243. | 13516. | 12455. | 11297. | 10198. | 9076. | 8117. | 7201. | 6344. | 5563. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 14526. | 12845. | 4991. | 2422. | 242194. |
| CMS | 411. | 364. | 141. | 69. | 6858. |
| INCHES | | 8.87 | 13.79 | 13.94 | 13.94 |
| MM | | 225.31 | 350.19 | 354.03 | 354.03 |
| AC-FT | | 6369. | 9900. | 10008. | 10008. |
| THOUS CU M | | 7856. | 12211. | 12345. | 12345. |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. |
| 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. |
| 3. | 3. | 3. | 3. | 3. | 4. | 4. | 5. | 6. | 7. |
| 8. | 12. | 15. | 12. | 4. | -1. | 4. | 20. | 48. | 83. |
| 114. | 138. | 152. | 158. | 156. | 149. | 138. | 124. | 108. | 94. |
| 82. | 71. | 61. | 53. | 45. | 39. | 34. | 30. | 26. | 23. |
| 27. | 43. | 71. | 106. | 146. | 187. | 231. | 281. | 337. | 399. |
| 466. | 534. | 640. | 825. | 1091. | 1426. | 1815. | 2254. | 2763. | 3563. |
| 4639. | 5699. | 6642. | 7422. | 8045. | 8562. | 9002. | 9365. | 9617. | 9684. |
| 9495. | 9011. | 8303. | 7531. | 6799. | 6051. | 5412. | 4801. | 4229. | 3708. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 9684. | 8563. | 3327. | 1615. | 161463. |
| CMS | 274. | 242. | 94. | 46. | 4572. |
| INCHES | | 5.91 | 9.19 | 9.29 | 9.29 |
| MM | | 150.21 | 233.46 | 236.02 | 236.02 |
| AC-FT | | 4246. | 6600. | 6672. | 6672. |
| THOUS CU M | | 5238. | 8141. | 8230. | 8230. |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 2. | 2. | 2. | 2. | 2. | 2. | 3. | 3. |
| 4. | 6. | 5. | 6. | 2. | -0. | 2. | 10. | 24. | 41. |
| 57. | 69. | 75. | 79. | 78. | 75. | 69. | 62. | 54. | 47. |
| 41. | 35. | 31. | 26. | 23. | 20. | 17. | 15. | 13. | 12. |
| 13. | 22. | 35. | 53. | 73. | 93. | 115. | 140. | 168. | 200. |
| 233. | 267. | 320. | 412. | 545. | 713. | 907. | 1127. | 1381. | 1781. |
| 2319. | 2850. | 3321. | 3711. | 4022. | 4281. | 4501. | 4683. | 4808. | 4842. |
| 4746. | 4505. | 4152. | 3765. | 3399. | 3025. | 2706. | 2400. | 2115. | 1854. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 4842. | 4282. | 1664. | 807. | 80731. |
| CMS | 137. | 121. | 47. | 23. | 2286. |
| INCHES | | 2.96 | 4.60 | 4.65 | 4.65 |
| MM | | 75.10 | 116.73 | 118.01 | 118.01 |
| AC-FT | | 2123. | 3300. | 3336. | 3336. |
| THOUS CU M | | 2619. | 4070. | 4115. | 4115. |

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********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

14 INFLOW FROM AREA ADJACENT TO RESERVOIR

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|---|---|---|---|---|---|---|---|---|
| 3 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

HYDROGRAPH DATA

| IHYDG | IUHG | TAREA | SNAP | TRSDA | TRSPC | RATIO | ISNOW | ISAME | LOCAL |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1.77 | 0.00 | 15.24 | 0.00 | 0.000 | 0 | 1 | 0 |

PRECIP DATA

| SPFE | PMS | R6 | R12 | R24 | R48 | R72 | R96 |
|---|---|---|---|---|---|---|---|
| 0.00 | 22.50 | 109.00 | 120.00 | 128.00 | 140.00 | 0.00 | 0.00 |

TRSPC COMPUTED BY THE PROGRAM IS .814

LOSS DATA

| LROPT | STRKR | DLTKR | RTIOL | ERAIN | STRKS | RTIOK | STRTL | CNSTL | ALSMX | RTIMP |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 2.00 | .10 | 0.00 | .01 |

UNIT HYDROGRAPH DATA
TP= 2.50 CP= .69 NTA= 0

RECESSION DATA
STRTQ= -.50 QRCSN= -.05 RTIOR= 1.60

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 5.99 AND R= 3.61 INTERVALS

UNIT HYDROGRAPH 23 END-OF-PERIOD ORDINATES, LAG= 2.48 HOURS, CP= .69 VOL= 1.00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 27. | 96. | 185. | 257. | 314. | 313. | 263. | 199. | 151. | 114. |
| 86. | 65. | 49. | 37. | 28. | 21. | 16. | 12. | 9. | 7. |
| 5. | 4. | 3. | | | | | | | |

END-OF-PERIOD FLOW

| MO.DA | HR.MN | PERIOD | RAIN | EXCS | LOSS | COMP Q | MO.DA | HR.MN | PERIOD | RAIN | EXCS | LOSS | COMP Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.01 | .30 | 1 | .00 | .00 | .00 | 1. | 1.02 | 1.30 | 51 | .05 | .00 | .05 | 2. |
| 1.01 | 1.00 | 2 | .00 | .00 | .00 | 1. | 1.02 | 2.00 | 52 | .05 | .00 | .05 | 1. |
| 1.01 | 1.30 | 3 | .00 | .00 | .00 | 1. | 1.02 | 2.30 | 53 | .05 | .00 | .05 | 1. |
| 1.01 | 2.00 | 4 | .00 | .00 | .00 | 1. | 1.02 | 3.00 | 54 | .05 | .00 | .05 | 1. |
| 1.01 | 2.30 | 5 | .00 | .00 | .00 | 1. | 1.02 | 3.30 | 55 | .05 | .00 | .05 | 1. |
| 1.01 | 3.00 | 6 | .00 | .00 | .00 | 1. | 1.02 | 4.00 | 56 | .05 | .00 | .05 | 1. |
| 1.01 | 3.30 | 7 | .00 | .00 | .00 | 1. | 1.02 | 4.30 | 57 | .05 | .00 | .05 | 1. |
| 1.01 | 4.00 | 8 | .00 | .00 | .00 | 1. | 1.02 | 5.00 | 58 | .05 | .00 | .05 | 1. |
| 1.01 | 4.30 | 9 | .00 | .00 | .00 | 1. | 1.02 | 5.30 | 59 | .05 | .00 | .05 | 1. |
| 1.01 | 5.00 | 10 | .00 | .00 | .00 | 1. | 1.02 | 6.00 | 60 | .05 | .00 | .05 | 1. |
| 1.01 | 5.30 | 11 | .00 | .00 | .00 | 1. | 1.02 | 6.30 | 61 | .17 | .12 | .05 | 4. |
| 1.01 | 6.00 | 12 | .00 | .00 | .00 | 1. | 1.02 | 7.00 | 62 | .17 | .12 | .05 | 16. |
| 1.01 | 6.30 | 13 | .02 | .00 | .02 | 1. | 1.02 | 7.30 | 63 | .17 | .12 | .05 | 37. |
| 1.01 | 7.00 | 14 | .02 | .00 | .02 | 1. | 1.02 | 8.00 | 64 | .17 | .12 | .05 | 69. |
| 1.01 | 7.30 | 15 | .02 | .00 | .02 | 1. | 1.02 | 8.30 | 65 | .17 | .12 | .05 | 106. |
| 1.01 | 8.00 | 16 | .02 | .00 | .02 | 1. | 1.02 | 9.00 | 66 | .17 | .12 | .05 | 143. |
| 1.01 | 8.30 | 17 | .02 | .00 | .02 | 1. | 1.02 | 9.30 | 67 | .17 | .12 | .05 | 174. |
| 1.01 | 9.00 | 18 | .02 | .00 | .02 | 1. | 1.02 | 10.00 | 68 | .17 | .12 | .05 | 197. |
| 1.01 | 9.30 | 19 | .02 | .00 | .02 | 1. | 1.02 | 10.30 | 69 | .17 | .12 | .05 | 215. |

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.01 | 10.00 | 20 | .02 | .00 | .02 | 1. | 1.02 | 11.00 | 70 | .17 | .12 | .05 | 229. |
| 1.01 | 10.30 | 21 | .02 | .00 | .02 | 1. | 1.02 | 11.30 | 71 | .17 | .12 | .05 | 239. |
| 1.01 | 11.00 | 22 | .02 | .00 | .02 | 1. | 1.02 | 12.00 | 72 | .17 | .12 | .05 | 246. |
| 1.01 | 11.30 | 23 | .02 | .00 | .02 | 1. | 1.02 | 12.30 | 73 | 1.00 | .95 | .05 | 275. |
| 1.01 | 12.00 | 24 | .02 | .00 | .02 | 1. | 1.02 | 13.00 | 74 | 1.00 | .95 | .05 | 359. |
| 1.01 | 12.30 | 25 | .09 | .00 | .09 | 1. | 1.02 | 13.30 | 75 | 1.20 | 1.15 | .05 | 521. |
| 1.01 | 13.00 | 26 | .09 | .00 | .09 | 1. | 1.02 | 14.00 | 76 | 1.20 | 1.15 | .05 | 764. |
| 1.01 | 13.30 | 27 | .11 | .00 | .11 | 1. | 1.02 | 14.30 | 77 | 1.50 | 1.45 | .05 | 1072. |
| 1.01 | 14.00 | 28 | .11 | .00 | .11 | 1. | 1.02 | 15.00 | 78 | 1.50 | 1.45 | .05 | 1415. |
| 1.01 | 14.30 | 29 | .14 | .00 | .14 | 1. | 1.02 | 15.30 | 79 | 1.82 | 1.77 | .05 | 1761. |
| 1.01 | 15.00 | 30 | .14 | .00 | .14 | 2. | 1.02 | 16.00 | 80 | 5.77 | 5.72 | .05 | 2207. |
| 1.01 | 15.30 | 31 | .17 | .00 | .17 | 2. | 1.02 | 16.30 | 81 | 1.40 | 1.35 | .05 | 2801. |
| 1.01 | 16.00 | 32 | .54 | .01 | .54 | 2. | 1.02 | 17.00 | 82 | 1.40 | 1.35 | .05 | 3426. |
| 1.01 | 16.30 | 33 | .13 | .00 | .13 | 3. | 1.02 | 17.30 | 83 | 1.10 | 1.05 | .05 | 3945. |
| 1.01 | 17.00 | 34 | .13 | .00 | .13 | 3. | 1.02 | 18.00 | 84 | 1.10 | 1.05 | .05 | 4227. |
| 1.01 | 17.30 | 35 | .10 | .01 | .10 | 4. | 1.02 | 18.30 | 85 | .07 | .02 | .05 | 4196. |
| 1.01 | 18.00 | 36 | .10 | .05 | .05 | 6. | 1.02 | 19.00 | 86 | .07 | .02 | .05 | 3532. |
| 1.01 | 18.30 | 37 | .01 | .00 | .01 | 10. | 1.02 | 19.30 | 87 | .07 | .02 | .05 | 3293. |
| 1.01 | 19.00 | 38 | .01 | .00 | .01 | 15. | 1.02 | 20.00 | 88 | .07 | .02 | .05 | 2732. |
| 1.01 | 19.30 | 39 | .01 | .00 | .01 | 19. | 1.02 | 20.30 | 89 | .07 | .02 | .05 | 2185. |
| 1.01 | 20.00 | 40 | .01 | .00 | .01 | 21. | 1.02 | 21.00 | 90 | .07 | .02 | .05 | 1694. |
| 1.01 | 20.30 | 41 | .01 | .00 | .01 | 20. | 1.02 | 21.30 | 91 | .07 | .02 | .05 | 1295. |
| 1.01 | 21.00 | 42 | .01 | .00 | .01 | 17. | 1.02 | 22.00 | 92 | .07 | .02 | .05 | 993. |
| 1.01 | 21.30 | 43 | .01 | .00 | .01 | 13. | 1.02 | 22.30 | 93 | .07 | .02 | .05 | 765. |
| 1.01 | 22.00 | 44 | .01 | .00 | .01 | 10. | 1.02 | 23.00 | 94 | .07 | .02 | .05 | 592. |
| 1.01 | 22.30 | 45 | .01 | .00 | .01 | 8. | 1.02 | 23.30 | 95 | .07 | .02 | .05 | 461. |
| 1.01 | 23.00 | 46 | .01 | .00 | .01 | 6. | 1.03 | 0.00 | 96 | .07 | .02 | .05 | 360. |
| 1.01 | 23.30 | 47 | .01 | .00 | .01 | 4. | 1.03 | .30 | 97 | 0.00 | 0.00 | 0.00 | 283. |
| 1.02 | 0.00 | 48 | .01 | .00 | .01 | 3. | 1.03 | 1.00 | 98 | 0.00 | 0.00 | 0.00 | 222. |
| 1.02 | .30 | 49 | .05 | .00 | .05 | 3. | 1.03 | 1.30 | 99 | 0.00 | 0.00 | 0.00 | 204. |
| 1.02 | 1.00 | 50 | .05 | .00 | .05 | 2. | 1.03 | 2.00 | 100 | 0.00 | 0.00 | 0.00 | 194. |
| | | | | | | | | | SUM | 25.65 | 21.17 | 4.48 | 47962. |
| | | | | | | | | | | ( 652.) | ( 538.) | ( 114.) | ( 1358.13) |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 4227. | 3013. | 993. | 479. | 47959. |
| CMS | 120. | 85. | 28. | 14. | 1355. |
| INCHES | | 15.84 | 20.87 | 20.96 | 20.96 |
| MM | | 402.23 | 530.19 | 532.40 | 532.40 |
| AC-FT | | 1494. | 1969. | 1976. | 1976. |
| THOUS CU M | | 1843. | 2429. | 2439. | 2439. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. |
| 2. | 2. | 3. | 3. | 4. | 6. | 10. | 15. | 19. | 21. |
| 20. | 17. | 13. | 10. | 8. | 6. | 4. | 3. | 3. | 2. |
| 2. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 4. | 16. | 37. | 69. | 106. | 143. | 174. | 197. | 215. | 229. |
| 239. | 246. | 275. | 359. | 521. | 764. | 1072. | 1415. | 1761. | 2207. |
| 2801. | 3426. | 3945. | 4227. | 4196. | 3932. | 3293. | 2732. | 2185. | 1694. |
| 1295. | 993. | 765. | 592. | 461. | 360. | 283. | 222. | 204. | 194. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 4227. | 3013. | 993. | 479. | 47859. |
| CMS | 120. | 85. | 28. | 14. | 1355. |

Sheet 42 of 57

| | | | | |
|---|---|---|---|---|
| INCHES | 15.84 | 20.87 | 20.96 | 20.96 |
| MM | 402.23 | 530.19 | 532.40 | 532.40 |
| AC-FT | 1494. | 1969. | 1978. | 1978. |
| THOUS CU M | 1843. | 2429. | 2439. | 2439. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 1. | 1. | 1. | 1. | 1. |
| 1. | 2. | 2. | 3. | 3. | 5. | 8. | 12. | 15. | 16. |
| 15. | 13. | 10. | 7. | 6. | 4. | 3. | 3. | 2. | 2. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 3. | 12. | 29. | 52. | 79. | 107. | 130. | 148. | 161. | 171. |
| 179. | 185. | 205. | 269. | 391. | 573. | 804. | 1061. | 1321. | 1655. |
| 2100. | 2573. | 2953. | 3170. | 3147. | 2874. | 2469. | 2049. | 1639. | 1271. |
| 971. | 745. | 574. | 444. | 346. | 270. | 212. | 167. | 153. | 146. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 3170. | 2250. | 745. | 359. | 35894. |
| CMS | 90. | 64. | 21. | 10. | 1016. |
| INCHES | | 11.88 | 15.66 | 15.72 | 15.72 |
| MM | | 301.67 | 397.65 | 399.30 | 399.30 |
| AC-FT | | 1121. | 1477. | 1483. | 1483. |
| THOUS CU M | | 1382. | 1822 | 1830. | 1830. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 1. | 1. | 1. |
| 1. | 1. | 1. | 2. | 2. | 3. | 5. | 8. | 10. | 11. |
| 10. | 8. | 6. | 5. | 4. | 3. | 2. | 2. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 2. | 9. | 19. | 34. | 53. | 71. | 87. | 99. | 108. | 114. |
| 119. | 123. | 137. | 179. | 261. | 382. | 536. | 707. | 881. | 1103. |
| 1400. | 1713. | 1972. | 2114. | 2098. | 1916. | 1646. | 1366. | 1093. | 847. |
| 642. | 497. | 382. | 296. | 231. | 180. | 141. | 111. | 102. | 97. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 2114. | 1537. | 496. | 239. | 23930. |
| CMS | 60. | 43. | 14. | 7. | 678. |
| INCHES | | 7.92 | 10.44 | 10.48 | 10.48 |
| MM | | 201.12 | 265.10 | 266.20 | 266.20 |
| AC-FT | | 747. | 985. | 989. | 989. |
| THOUS CU M | | 921. | 1215. | 1220. | 1220. |

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 1. | 1. | 1. | 1. | 2. | 3. | 4. | 5. | 5. |
| 5. | 4. | 3. | 2. | 2. | 1. | 1. | 1. | 1. | 1. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 1. | 4. | 9. | 17. | 26. | 36. | 43. | 49. | 54. | 57. |
| 60. | 62. | 69. | 90. | 130. | 191. | 269. | 354. | 440. | 552. |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 700. | 857. | 986. | 1057. | 1049. | 958. | 823. | 693. | 546. | 424. |
| 324. | 248. | 191. | 148. | 115. | 90. | 71. | 56. | 51. | 49. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 1057. | 753. | 248. | 120. | 11965. |
| CMS | 30. | 21. | 7. | 3. | 339. |
| INCHES | | 3.96 | 5.22 | 5.24 | 5.24 |
| MM | | 100.56 | 132.55 | 133.10 | 133.10 |
| AC-FT | | 374. | 492. | 494. | 494. |
| THOUS CU M | | 461. | 607. | 610. | 610. |

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COMBINE HYDROGRAPHS

15 COMBINE ADJACENT AREA FLOW WITH RIVER FLOW AT RESERVOIR

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|---|---|---|---|---|---|---|---|---|
| 3 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 7. | 7. | 7. | 7. | 7. | 7. | 7. | 7. | 7. | 6. |
| 6. | 6. | 6. | 6. | 6. | 6. | 6. | 6. | 6. | 6. |
| 7. | 7. | 7. | 7. | 7. | 8. | 9. | 11. | 13. | 15. |
| 18. | 27. | 34. | 27. | 12. | 5. | 19. | 55. | 115. | 187. |
| 248. | 292. | 317. | 325. | 320. | 304. | 280. | 251. | 219. | 190. |
| 166. | 143. | 124. | 107. | 92. | 80. | 69. | 61. | 53. | 47. |
| 56. | 102. | 179. | 281. | 397. | 516. | 636. | 758. | 889. | 1027. |
| 1171. | 1314. | 1554. | 2008. | 2703. | 3616. | 4701. | 5924. | 7287. | 9332. |
| 12078. | 14825. | 17229. | 19072. | 20285. | 20956. | 21296. | 21462. | 21419. | 21052. |
| 20296. | 19015. | 17371. | 15654. | 14059. | 12462. | 11106. | 9824. | 8662. | 7611. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 21462. | 19558. | 7648. | 3708. | 370784. |
| CMS | 608. | 554. | 217. | 105. | 10499. |
| INCHES | | 11.94 | 18.67 | 18.86 | 18.86 |
| MM | | 303.22 | 474.27 | 479.05 | 479.05 |
| AC-FT | | 9698. | 15169. | 15322. | 15322. |
| THOUS CU M | | 11962. | 18711. | 18899. | 18899. |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5. | 5. | 5. | 5. | 5. | 5. | 5. | 5. | 5. | 5. |
| 5. | 5. | 5. | 4. | 4. | 5. | 5. | 5. | 5. | 5. |
| 5. | 5. | 5. | 5. | 5. | 6. | 7. | 8. | 9. | 11. |
| 14. | 20. | 25. | 20. | 9. | 4. | 14. | 41. | 86. | 140. |
| 186. | 219. | 238. | 244. | 240. | 228. | 210. | 188. | 164. | 143. |
| 124. | 107. | 93. | 80. | 69. | 60. | 52. | 46. | 40. | 36. |
| 43. | 76. | 134. | 211. | 298. | 387. | 477. | 569. | 666. | 771. |
| [illegible] | 935. | 1165. | 1506. | 2027. | 2712. | 3526. | 4443. | 5465. | 6999. |
| 9559. | 11119. | 12522. | 14304. | 15213. | 15717. | 15977. | 16097. | 16066. | 15797. |
| 15214. | 14262. | 13029. | 11741. | 10544. | 9346. | 8330. | 7369. | 6497. | 5708. |

Sheet 44 of 57

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 16097. | 14668. | 5736. | 2791. | 275068. |
| CMS | 456. | 415. | 162. | 79. | 7875. |
| INCHES | | 8.95 | 14.00 | 14.15 | 14.15 |
| MM | | 227.41 | 355.70 | 359.29 | 359.29 |
| AC-FT | | 7274. | 11377. | 11491. | 11491. |
| THOUS CU M | | 8972. | 14033. | 14174. | 14174. |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4. | 4. | 4. | 4. | 4. | 3. | 3. | 3. | 3. | 3. |
| 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. |
| 3. | 3. | 3. | 3. | 4. | 4. | 4. | 5. | 6. | 7. |
| 9. | 13. | 17. | 14. | 6. | 3. | 10. | 28. | 58. | 93. |
| 124. | 146. | 159. | 163. | 160. | 152. | 140. | 125. | 109. | 95. |
| 83. | 72. | 62. | 53. | 46. | 40. | 35. | 30. | 27. | 24. |
| 29. | 51. | 89. | 140. | 199. | 258. | 318. | 379. | 444. | 514. |
| 566. | 657. | 777. | 1004. | 1351. | 1808. | 2351. | 2962. | 3643. | 4656. |
| 6339. | 7413. | 8614. | 9536. | 10142. | 10478. | 10648. | 10731. | 10709. | 10531. |
| 10143. | 9508. | 8686. | 7827. | 7029. | 6231. | 5553. | 4912. | 4331. | 3836. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 10731. | 9779. | 3824. | 1954. | 185392. |
| CMS | 304. | 277. | 108. | 52. | 5250. |
| INCHES | | 5.97 | 9.34 | 9.43 | 9.43 |
| MM | | 151.61 | 237.14 | 239.52 | 239.52 |
| AC-FT | | 4849. | 7584. | 7661. | 7661. |
| THOUS CU M | | 5981. | 9355. | 9450. | 9450. |

SUM OF 2 HYDROGRAPHS AT 3 PLAN 1 RTIO 4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 1. | 1. | 2. | 2. | 2. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 3. | 3. | 4. |
| 5. | 7. | 8. | 7. | 3. | 1. | 5. | 14. | 29. | 47. |
| 62. | 73. | 79. | 81. | 80. | 76. | 70. | 63. | 55. | 48. |
| 41. | 35. | 31. | 27. | 23. | 20. | 17. | 15. | 13. | 12. |
| 14. | 25. | 45. | 70. | 99. | 129. | 159. | 190. | 222. | 257. |
| 293. | 329. | 398. | 502. | 676. | 904. | 1175. | 1481. | 1822. | 2333. |
| 3020. | 3706. | 4307. | 4768. | 5071. | 5239. | 5374. | 5365. | 5355. | 5266. |
| 5071. | 4754. | 4343. | 3914. | 3515. | 3115. | 2777. | 2456. | 2166. | 1903. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 5366. | 4889. | 1912. | 927. | 92696. |
| CMS | 152. | 138. | 54. | 26. | 2625. |
| INCHES | | 2.98 | 4.67 | 4.72 | 4.72 |
| MM | | 75.80 | 118.57 | 119.76 | 119.76 |
| AC-FT | | 2425. | 3792. | 3830. | 3830. |
| THOUS CU M | | 2991. | 4678. | 4725. | 4725. |

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```
                                        HYDROGRAPH ROUTING

                 16 ROUTE THROUGH MAMARONECK RESERVOIR

                               ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                                   4       1       0       0       0       0       1       0       0
                                                     ROUTING DATA
                      QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
                        0.0   0.000    0.00       1       1       0       0               0

                               NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                                   1       0       0   0.000   0.000   0.000    107.      -1

    STAGE        40.00        42.30        44.00        46.00        50.00

     FLOW         0.00       450.00      1400.00      4240.00      7890.00

     CAPACITY=       85.      107.      640.

    ELEVATION=       33.       40.       50.

                             CREL   SPWID    COQW    EXPW   ELEVL    COQL   CAREA    EXPL
                             40.0     0.0     0.0     0.0    34.5      .6    37.8      .5

                                                   DAM DATA
                                          TOPEL    COQD    EXPD   DAMWID
                                           44.0     3.1     1.5     35.

                                         STATION      4, PLAN 1, RATIO 1

                                         END-OF-PERIOD HYDROGRAPH ORDINATES

                                                    OUTFLOW
               1.       2.       3.       4.       4.       5.       5.       5.       5.       4.
               6.       6.       6.       6.       6.       6.       6.       6.       6.       6.
               6.       6.       6.       6.       6.       7.       7.       7.       8.       9.
              10.      12.      15.      17.      18.      16.      16.      19.      30.      49.
              76.     107.     139.     168.     193.     212.     225.     231.     232.     228.
             220.     209.     197.     184.     170.     157.     144.     131.     119.     108.
              99.      96.     103.     124.     158.     206.     265.     335.     413.     546.
             719.     882.    1054.    1283.    1903.    2846.    3851.    4895.    5970.    7480.
            9625.   12246.   14905.   17235.   19015.   20196.   20894.   21251.   21392.   21279.
           20830.   19958.   18662.   17099.   15486.   13905.   12419.   11065.    9825.    8691.

                                                    STORAGE
             107.     108.     108.     108.     108.     108.     108.     108.     108.     108.
             108.     108.     108.     108.     108.     108.     108.     108.     108.     108.
             108.     108.     108.     109.     109.     109.     109.     109.     109.     109.
             109.     110.     111.     111.     111.     111.     111.     112.     114.     119.
             125.     132.     140.     147.     153.     157.     160.     162.     162.     161.
             159.     157.     154.     151.     147.     144.     141.     138.     135.     133.
             131.     130.     131.     136.     144.     156.     170.     186.     205.     225.
             244.     262.     281.     307.     338.     371.     404.     443.     491.     557.
             646.     750.     851.     937.    1001.    1043.    1067.    1080.    1085.    1081.
            1066.    1035.     989.     932.     873.     813.     757.     704.     654.     608.

                                                     STAGE
             40.0     40.0     40.0     40.0     40.0     40.0     40.0     40.0     40.0     40.0
             40.0     40.0     40.0     40.0     40.0     40.0     40.0     40.0     40.0     40.0
             40.0     40.0     40.0     40.0     40.0     40.0     40.0     40.0     40.0     40.0
```

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 40.0 | 40.1 | 40.1 | 40.1 | 40.1 | 40.1 | 40.1 | 40.1 | 40.1 | 40.2 |
| 40.3 | 40.5 | 40.6 | 40.7 | 40.9 | 40.9 | 41.0 | 41.0 | 41.0 | 41.0 |
| 41.0 | 40.9 | 40.9 | 40.8 | 40.8 | 40.7 | 40.6 | 40.6 | 40.5 | 40.5 |
| 40.4 | 40.4 | 40.5 | 40.5 | 40.7 | 40.9 | 41.2 | 41.5 | 41.8 | 42.2 |
| 42.5 | 42.9 | 43.3 | 43.7 | 44.3 | 44.9 | 45.5 | 46.3 | 47.2 | 48.4 |
| 50.1 | 52.1 | 54.0 | 55.6 | 56.8 | 57.6 | 58.3 | 58.3 | 58.4 | 58.3 |
| 55.0 | 57.4 | 56.5 | 55.5 | 54.4 | 53.3 | 52.2 | 51.2 | 50.3 | 49.4 |

PEAK OUTFLOW IS 21392. AT TIME 44.50 HOURS

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 21392. | 19416. | 7420. | 3587. | 358674. |
| CMS | 606. | 550. | 210. | 102. | 10157. |
| INCHES | | 11.85 | 18.12 | 18.24 | 18.24 |
| MM | | 301.03 | 460.17 | 463.40 | 463.40 |
| AC-FT | | 9628. | 14718. | 14821. | 14821. |
| THOUS CU M | | 11876. | 18154. | 18282. | 18282. |

STATION 4, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 2. | 2. | 3. | 3. | 3. | 4. | 4. | 4. | 4. |
| 4. | 4. | 4. | 4. | 4. | 4. | 4. | 4. | 5. | 5. |
| 5. | 5. | 5. | 5. | 5. | 5. | 5. | 6. | 6. | 7. |
| 8. | 9. | 11. | 13. | 13. | 12. | 12. | 14. | 22. | 37. |
| 57. | 80. | 104. | 126. | 145. | 159. | 169. | 174. | 174. | 171. |
| 165. | 157. | 145. | 138. | 128. | 118. | 108. | 98. | 89. | 91. |
| 74. | 72. | 77. | 93. | 119. | 155. | 199. | 251. | 310. | 375. |
| 447. | 596. | 745. | 929. | 1189. | 1765. | 2778. | 3700. | 4646. | 5635. |
| 7171. | 9099. | 11081. | 12835. | 14187. | 15094. | 15630. | 15919. | 16035. | 15960. |
| 15634. | 14994. | 14037. | 12876. | 11671. | 10487. | 9370. | 8354. | 7418. | 6565. |

STORAGE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 107. | 107. | 108. | 108. | 108. | 108. | 108. | 108. | 108. | 108. |
| 108. | 108. | 108. | 108. | 108. | 108. | 108. | 108. | 108. | 108. |
| 108. | 108. | 108. | 108. | 108. | 108. | 108. | 108. | 108. | 109. |
| 109. | 109. | 110. | 110. | 110. | 110. | 110. | 110. | 112. | 116. |
| 121. | 126. | 132. | 137. | 141. | 145. | 147. | 149. | 148. | 147. |
| 140. | 144. | 142. | 140. | 137. | 135. | 133. | 130. | 128. | 126. |
| 125. | 124. | 125. | 129. | 135. | 144. | 154. | 166. | 180. | 196. |
| 213. | 230. | 247. | 267. | 297. | 333. | 368. | 399. | 431. | 477. |
| 544. | 624. | 704. | 773. | 824. | 858. | 878. | 889. | 893. | 890. |
| 878. | 854. | 819. | 774. | 727. | 681. | 636. | 594. | 554. | 518. |

STAGE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 |
| 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 |
| 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 |
| 40.0 | 40.0 | 40.1 | 40.1 | 40.1 | 40.1 | 40.1 | 40.1 | 40.1 | 40.2 |
| 40.3 | 40.4 | 40.5 | 40.6 | 40.6 | 40.7 | 40.7 | 40.8 | 40.8 | 40.8 |
| 40.7 | 40.7 | 40.7 | 40.6 | 40.6 | 40.5 | 40.5 | 40.4 | 40.4 | 40.4 |
| 40.3 | 40.3 | 40.3 | 40.4 | 40.5 | 40.7 | 40.9 | 41.1 | 41.4 | 41.7 |
| 42.0 | 42.3 | 42.6 | 43.0 | 43.6 | 44.2 | 44.9 | 45.5 | 46.1 | 46.9 |
| 45.2 | 49.7 | 51.2 | 52.5 | 53.5 | 54.4 | 54.5 | 54.7 | 54.7 | 54.7 |
| 54.5 | 54.0 | 53.3 | 52.5 | 51.6 | 50.3 | 49.9 | 49.1 | 48.4 | 47.7 |

Sheet 47 of 57

PEAK OUTFLOW IS 16035. AT TIME 44.50 HOURS

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 16035. | 14548. | 5547. | 2582. | 268156. |
| CMS | 454. | 412. | 157. | 73. | 7593. |
| INCHES | | 8.88 | 13.54 | 13.64 | 13.64 |
| MM | | 225.55 | 344.03 | 346.45 | 346.45 |
| AC-FT | | 7214. | 11003. | 11081. | 11081. |
| THOUS CU M | | 8898. | 13572. | 13668. | 13668. |

STATION 4, PLAN 1, RATIO 3

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 1. | 2. | 2. | 2. | 2. | 3. | 3. | 3. |
| 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. |
| 3. | 3. | 3. | 3. | 3. | 3. | 3. | 4. | 4. | 4. |
| 5. | 6. | 8. | 9. | 9. | 8. | 9. | 10. | 15. | 25. |
| 38. | 54. | 69. | 84. | 96. | 106. | 112. | 116. | 116. | 114. |
| 110. | 105. | 98. | 92. | 85. | 78. | 72. | 65. | 60. | 54. |
| 50. | 48. | 52. | 62. | 79. | 103. | 133. | 167. | 207. | 250. |
| 292. | 350. | 409. | 520. | 725. | 991. | 1329. | 2203. | 3035. | 3895. |
| 4920. | 6059. | 7320. | 8475. | 9397. | 10010. | 10356. | 10593. | 10680. | 10639. |
| 10433. | 10020. | 9395. | 8633. | 7836. | 7047. | 6302. | 5622. | 4995. | 4391. |

STORAGE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 107. | 107. | 107. | 107. | 107. | 108. | 108. | 108. | 108. | 108. |
| 108. | 108. | 108. | 109. | 108. | 108. | 108. | 108. | 108. | 108. |
| 108. | 108. | 108. | 108. | 108. | 108. | 108. | 108. | 108. | 108. |
| 108. | 108. | 109. | 109. | 109. | 109. | 109. | 109. | 111. | 113. |
| 116. | 120. | 123. | 127. | 130. | 132. | 134. | 134. | 134. | 134. |
| 133. | 132. | 130. | 129. | 127. | 126. | 124. | 123. | 121. | 120. |
| 119. | 118. | 119. | 122. | 126. | 131. | 138. | 147. | 156. | 156. |
| 178. | 190. | 204. | 221. | 244. | 274. | 312. | 349. | 377. | 436. |
| 445. | 495. | 550. | 599. | 636. | 661. | 677. | 685. | 688. | 687. |
| 678. | 662. | 637. | 605. | 572. | 539. | 506. | 476. | 448. | 422. |

STAGE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 |
| 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 |
| 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 |
| 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.1 | 40.1 |
| 40.2 | 40.2 | 40.3 | 40.4 | 40.4 | 40.5 | 40.5 | 40.5 | 40.5 | 40.5 |
| 40.5 | 40.5 | 40.4 | 40.4 | 40.4 | 40.3 | 40.3 | 40.3 | 40.3 | 40.2 |
| 40.2 | 40.2 | 40.2 | 40.3 | 40.4 | 40.5 | 40.6 | 40.7 | 40.9 | 41.1 |
| 41.3 | 41.6 | 41.8 | 42.1 | 42.6 | 43.1 | 43.9 | 44.5 | 45.1 | 45.6 |
| 46.3 | 47.3 | 48.3 | 49.2 | 49.9 | 50.4 | 50.7 | 50.8 | 50.9 | 50.9 |
| 50.7 | 50.4 | 49.9 | 49.3 | 48.7 | 48.1 | 47.5 | 46.9 | 46.4 | 45.9 |

PEAK OUTFLOW IS 10680. AT TIME 44.50 HOURS

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 10680. | 9686. | 3678. | 1778. | 177773. |
| CMS | 302. | 274. | 104. | 50. | 5034. |

Sheet 48 of 57

| | | | | | |
|---|---|---|---|---|---|
| INCHES | 5.91 | 8.98 | 9.04 | | 9.04 |
| MM | 150.17 | 228.07 | 229.69 | | 229.69 |
| AC-FT | 4803. | 7294. | 7346. | | 7346. |
| THOUS CU M | 5924. | 8998. | 9061. | | 9061. |

STATION 4, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 3. | 3. | 4. | 4. | 4. | 4. | 4. | 5. | 7. | 12. |
| 19. | 27. | 35. | 42. | 48. | 53. | 56. | 58. | 58. | 57. |
| 55. | 52. | 49. | 46. | 43. | 39. | 36. | 33. | 30. | 27. |
| 25. | 24. | 26. | 31. | 40. | 52. | 66. | 84. | 103. | 125. |
| 149. | 175. | 204. | 243. | 299. | 377. | 515. | 768. | 1043. | 1355. |
| 2282. | 3100. | 3795. | 4371. | 4746. | 4999. | 5175. | 5281. | 5330. | 5318. |
| 5224. | 5030. | 4732. | 4311. | 3848. | 3438. | 3062. | 2723. | 2412. | 2129. |

STORAGE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 107. | 107. | 107. | 107. | 107. | 107. | 107. | 107. | 107. | 107. |
| 107. | 107. | 107. | 107. | 107. | 107. | 107. | 107. | 107. | 107. |
| 107. | 107. | 107. | 107. | 107. | 107. | 107. | 107. | 107. | 108. |
| 108. | 109. | 108. | 108. | 108. | 108. | 108. | 108. | 109. | 110. |
| 112. | 113. | 115. | 117. | 118. | 120. | 120. | 121. | 121. | 120. |
| 120. | 119. | 119. | 118. | 117. | 116. | 116. | 115. | 114. | 113. |
| 113. | 113. | 113. | 114. | 116. | 119. | 123. | 127. | 131. | 137. |
| 142. | 148. | 155. | 165. | 178. | 196. | 221. | 249. | 280. | 316. |
| 351. | 379. | 402. | 421. | 436. | 448. | 456. | 461. | 463. | 462. |
| 452. | 449. | 435. | 419. | 404. | 391. | 378. | 367. | 356. | 348. |

STAGE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 |
| 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 |
| 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 |
| 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.1 |
| 40.1 | 40.1 | 40.2 | 40.2 | 40.2 | 40.2 | 40.2 | 40.3 | 40.3 | 40.3 |
| 40.2 | 40.2 | 40.2 | 40.2 | 40.2 | 40.2 | 40.2 | 40.1 | 40.1 | 40.1 |
| 40.1 | 40.1 | 40.1 | 40.1 | 40.2 | 40.2 | 40.3 | 40.4 | 40.5 | 40.6 |
| 40.7 | 40.8 | 40.9 | 41.1 | 41.3 | 41.7 | 42.1 | 42.7 | 43.2 | 43.9 |
| 44.6 | 45.1 | 45.5 | 45.9 | 46.2 | 46.4 | 46.5 | 46.6 | 46.7 | 46.7 |
| 46.6 | 46.4 | 46.2 | 45.9 | 45.6 | 45.3 | 45.1 | 44.9 | 44.7 | 44.5 |

PEAK OUTFLOW IS 5330. AT TIME 44.50 HOURS

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 5330. | 4862. | 1798. | 869. | 86909. |
| CMS | 151. | 138. | 51. | 25. | 2461. |
| INCHES | | 2.97 | 4.39 | 4.42 | 4.42 |
| MM | | 75.37 | 111.48 | 112.29 | 112.29 |
| AC-FT | | 2411. | 3565. | 3591. | 3591. |
| THOUS CU M | | 2974. | 4398. | 4430. | 4430. |

Sheet 49 of 57

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

17 CHANNEL ROUTE AT STATION 8+00 (ROAD CROSSING)

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|---|---|---|---|---|---|---|---|---|
| 17 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

ROUTING DATA

| QLOSS | CLOSS | AVG | IRES | ISAME | IOPT | IPMP | | LSTR |
|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.000 | 0.00 | 1 | 1 | 0 | 0 | | 0 |

| NSTPS | NSTDL | LAG | AMSKK | X | TSK | STORA | ISPRAT |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0.000 | 0.000 | 0.000 | 0. | 0 |

NORMAL DEPTH CHANNEL ROUTING

| QN(1) | QN(2) | QN(3) | ELNVT | ELMAX | RLNTH | SEL |
|---|---|---|---|---|---|---|
| .0350 | .0350 | .0350 | 24.0 | 50.0 | 800. | .00380 |

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 50.00 | 220.00 | 40.00 | 360.00 | 30.00 | 365.00 | 24.00 | 415.00 | 24.00 |
| 420.00 | 30.00 | 600.00 | 40.00 | 750.00 | 50.00 | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| STORAGE | 0.00 | 1.29 | 2.63 | 4.03 | 5.48 | 7.20 | 9.93 | 13.77 | 18.70 | 24.74 |
| | 31.86 | 40.12 | 49.46 | 60.04 | 71.29 | 85.01 | 99.41 | 115.08 | 132.02 | 150.23 |
| OUTFLOW | 0.00 | 219.49 | 692.54 | 1355.29 | 2182.91 | 3239.94 | 4682.89 | 6652.55 | 9293.25 | 12692.64 |
| | 16988.13 | 22269.90 | 28582.96 | 36007.40 | 44773.67 | 54975.87 | 66708.06 | 80362.76 | 95130.59 | 112000.13 |
| STAGE | 24.00 | 25.37 | 26.74 | 28.11 | 29.47 | 30.84 | 32.21 | 33.58 | 34.95 | 36.32 |
| | 37.68 | 39.05 | 40.42 | 41.79 | 43.16 | 44.53 | 45.89 | 47.26 | 48.63 | 50.00 |
| FLOW | 0.00 | 219.49 | 692.54 | 1355.29 | 2182.91 | 3239.94 | 4682.89 | 6652.55 | 9293.25 | 12692.64 |
| | 16988.13 | 22269.90 | 28582.96 | 36007.40 | 44773.67 | 54975.87 | 66708.06 | 80362.76 | 95130.59 | 112000.13 |

STATION 17, PLAN 1, RTIO 1

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2. | 2. | 3. | 3. | 4. | 5. | 5. | 5. | 5. | 6. |
| 6. | 6. | 6. | 6. | 6. | 6. | 6. | 6. | 6. | 6. |
| 6. | 6. | 6. | 6. | 6. | 7. | 7. | 7. | 8. | 9. |
| 10. | 12. | 15. | 17. | 18. | 17. | 16. | 18. | 28. | 46. |
| 72. | 103. | 135. | 164. | 190. | 210. | 224. | 231. | 232. | 228. |
| 220. | 211. | 197. | 186. | 172. | 159. | 145. | 133. | 121. | 110. |
| 100. | 96. | 102. | 120. | 152. | 199. | 261. | 329. | 408. | 536. |
| 702. | 876. | 1043. | 1268. | 1863. | 2809. | 3802. | 4848. | 5916. | 7397. |
| 9517. | 12130. | 14803. | 17149. | 18964. | 20157. | 20869. | 21238. | 21393. | 21286. |
| 20656. | 19997. | 18723. | 17157. | 15554. | 13965. | 12479. | 11124. | 9876. | 8740. |

STOR

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |

Sheet 50 of 57

Sheet 6 of 61

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. | 2. |
| 3. | 3. | 3. | 4. | 5. | 6. | 8. | 10. | 12. | 15. |
| 19. | 24. | 28. | 32. | 35. | 37. | 38. | 39. | 39. | 39. |
| 38. | 37. | 35. | 32. | 29. | 27. | 24. | 22. | 20. | 18. |

STAGE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 |
| 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 |
| 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.1 |
| 24.1 | 24.1 | 24.1 | 24.1 | 24.1 | 24.1 | 24.1 | 24.1 | 24.2 | 24.3 |
| 24.4 | 24.6 | 24.8 | 25.0 | 25.2 | 25.3 | 25.4 | 25.4 | 25.4 | 25.4 |
| 25.4 | 25.3 | 25.2 | 25.2 | 25.1 | 25.0 | 24.9 | 24.8 | 24.8 | 24.7 |
| 24.6 | 24.6 | 24.6 | 24.7 | 25.0 | 25.2 | 25.5 | 25.7 | 25.9 | 26.3 |
| 26.8 | 27.1 | 27.5 | 27.9 | 28.9 | 30.3 | 31.4 | 32.3 | 33.1 | 34.0 |
| 35.0 | 36.1 | 37.0 | 37.7 | 38.2 | 38.5 | 39.7 | 38.8 | 39.8 | 39.8 |
| 36.7 | 38.5 | 38.1 | 37.7 | 37.2 | 36.7 | 36.2 | 35.7 | 35.2 | 34.7 |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 21393. | 19434. | 7412. | 3582. | 358247. |
| CMS | 606. | 550. | 210. | 101. | 10144. |
| INCHES | | 11.85 | 18.10 | 18.22 | 18.22 |
| MM | | 300.99 | 459.65 | 462.95 | 462.85 |
| AC-FT | | 9627. | 14701. | 14804. | 14804. |
| THOUS CU M | | 11874. | 18134. | 18250. | 18260. |

MAXIMUM STORAGE = 39.

MAXIMUM STAGE IS 38.8

STATION 17, PLAN 1, RTIO 2

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 2. | 3. | 3. | 3. | 4. | 4. | 4. | 4. |
| 4. | 4. | 4. | 4. | 4. | 4. | 4. | 4. | 5. | 5. |
| 5. | 5. | 5. | 5. | 5. | 5. | 5. | 5. | 6. | 7. |
| 7. | 9. | 11. | 13. | 13. | 12. | 12. | 14. | 21. | 34. |
| 54. | 77. | 101. | 123. | 142. | 157. | 163. | 173. | 174. | 171. |
| 166. | 158. | 149. | 139. | 129. | 119. | 109. | 100. | 91. | 82. |
| 75. | 72. | 76. | 93. | 114. | 149. | 192. | 246. | 306. | 370. |
| 443. | 581. | 739. | 916. | 1175. | 1729. | 2732. | 3667. | 4594. | 5593. |
| 7075. | 9019. | 10991. | 12772. | 14140. | 15067. | 15613. | 15912. | 16032. | 15968. |
| 15652. | 15027. | 14091. | 12925. | 11724. | 10536. | 9417. | 8399. | 7458. | 6602. |

STOR

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 0. |
| 0. | 0. | 0. | 1. | 1. | 1. | 1. | 1. | 2. | 2. |
| 2. | 2. | 3. | 3. | 4. | 5. | 6. | 8. | 10. | 12. |

Sheet 51 of 57

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15. | 18. | 22. | 25. | 27. | 29. | 30. | 30. | 30. | 30. |
| 30. | 29. | 27. | 25. | 23. | 21. | 19. | 17. | 15. | 14. |

STAGE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 |
| 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 |
| 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 |
| 24.0 | 24.1 | 24.1 | 24.1 | 24.1 | 24.1 | 24.1 | 24.1 | 24.1 | 24.2 |
| 24.3 | 24.5 | 24.6 | 24.8 | 24.9 | 25.0 | 25.0 | 25.1 | 25.1 | 25.1 |
| 25.0 | 25.0 | 24.9 | 24.9 | 24.8 | 24.7 | 24.7 | 24.6 | 24.6 | 24.5 |
| 24.5 | 24.4 | 24.5 | 24.6 | 24.7 | 24.9 | 25.2 | 25.4 | 25.6 | 25.8 |
| 26.0 | 26.4 | 25.8 | 27.2 | 27.7 | 28.7 | 30.2 | 31.2 | 32.1 | 32.8 |
| 33.8 | 34.6 | 35.6 | 36.3 | 36.8 | 37.1 | 37.2 | 37.3 | 37.4 | 37.4 |
| 37.3 | 37.1 | 36.8 | 36.4 | 35.9 | 35.5 | 35.3 | 34.5 | 34.0 | 33.5 |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 16032. | 14546. | 5541. | 2578. | 267826. |
| CMS | 454. | 412. | 157. | 76. | 7584. |
| INCHES | | 8.88 | 13.53 | 13.62 | 13.62 |
| MM | | 225.51 | 343.63 | 346.03 | 346.03 |
| AC-FT | | 7213. | 10990. | 11067. | 11067. |
| THOUS CU M | | 8897. | 13556. | 13651. | 13651. |

MAXIMUM STORAGE = 30.

MAXIMUM STAGE IS 37.4

STATION 17, PLAN 1, RTIO 3

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 1. | 2. | 2. | 2. | 2. | 2. | 3. | 3. | 3. |
| 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. | 3. |
| 3. | 3. | 3. | 3. | 3. | 3. | 3. | 4. | 4. | 4. |
| 5. | 6. | 7. | 9. | 9. | 8. | 8. | 9. | 14. | 23. |
| 86. | 81. | 67. | 82. | 95. | 105. | 112. | 115. | 116. | 114. |
| 110. | 108. | 99. | 93. | 86. | 79. | 73. | 66. | 60. | 55. |
| 50. | 48. | 51. | 60. | 76. | 99. | 128. | 162. | 201. | 247. |
| 295. | 346. | 405. | 510. | 708. | 979. | 1307. | 2157. | 3018. | 3939. |
| 4857. | 5996. | 7266. | 8425. | 9354. | 9989. | 10374. | 10586. | 10678. | 10643. |
| 13446. | 10542. | 9427. | 8671. | 7871. | 7083. | 6335. | 5653. | 5023. | 4419. |

STOR

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 1. | 1. | 1. | 1. | 1. |
| 1. | 2. | 2. | 2. | 3. | 3. | 4. | 5. | 7. | 8. |
| 10. | 12. | 15. | 17. | 19. | 20. | 21. | 21. | 21. | 21. |
| 21. | 20. | 19. | 18. | 16. | 15. | 13. | 12. | 11. | 9. |

STAGE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 |
| 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 |
| 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 24.0 | 24.0 | 24.0 | 24.1 | 24.1 | 24.1 | 24.0 | 24.1 | 24.1 | 24.1 |
| 24.2 | 24.3 | 24.4 | 24.5 | 24.6 | 24.7 | 24.7 | 24.7 | 24.7 | 24.7 |
| 24.7 | 24.7 | 24.6 | 24.6 | 24.5 | 24.5 | 24.5 | 24.4 | 24.4 | 24.3 |
| 24.3 | 24.3 | 24.3 | 24.4 | 24.5 | 24.6 | 24.9 | 25.0 | 25.3 | 25.4 |
| 25.6 | 25.7 | 25.9 | 26.2 | 26.8 | 27.3 | 28.0 | 29.4 | 30.6 | 31.4 |
| 32.4 | 33.1 | 33.9 | 34.5 | 35.0 | 35.2 | 35.4 | 35.5 | 35.5 | 35.5 |
| 35.4 | 35.3 | 35.0 | 34.6 | 34.2 | 33.9 | 33.4 | 32.9 | 32.4 | 32.0 |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 10678. | 9684. | 3673. | 1775. | 177550. |
| CMS | 302. | 274. | 104. | 50. | 5028. |
| INCHES | | 5.91 | 8.97 | 9.03 | 9.03 |
| MM | | 150.13 | 227.79 | 229.39 | 229.39 |
| AC-FT | | 4802. | 7286. | 7337. | 7337. |
| THOUS CU M | | 5923. | 8987. | 9050. | 9050. |

MAXIMUM STORAGE = 21.

MAXIMUM STAGE IS 35.5

STATION 17, PLAN 1, RTIO 4

OUTFLOW

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. |
| 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. | 2. |
| 2. | 3. | 4. | 4. | 4. | 4. | 4. | 5. | 7. | 11. |
| 18. | 26. | 34. | 41. | 47. | 52. | 56. | 58. | 58. | 57. |
| 55. | 53. | 53. | 46. | 43. | 40. | 36. | 33. | 30. | 27. |
| 25. | 24. | 25. | 30. | 38. | 50. | 64. | 81. | 100. | 122. |
| 146. | 171. | 200. | 239. | 295. | 371. | 504. | 748. | 1034. | 1342. |
| 2229. | 3085. | 3751. | 4360. | 4723. | 4996. | 5163. | 5282. | 5325. | 5323. |
| 3222. | 5044. | 4746. | 4335. | 3868. | 3456. | 3076. | 2736. | 2424. | 2140. |

STOR

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | 2. | 2. | 3. | 3. | 4. |
| 6. | 7. | 8. | 9. | 10. | 11. | 11. | 11. | 11. | 11. |
| 11. | 11. | 10. | 9. | 8. | 8. | 7. | 6. | 6. | 5. |

STAGE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 |
| 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 |
| 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 |
| 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.1 |
| 24.1 | 24.2 | 24.2 | 24.3 | 24.3 | 24.3 | 24.3 | 24.4 | 24.4 | 24.4 |
| 24.3 | 24.3 | 24.3 | 24.3 | 24.3 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 |
| 24.2 | 24.1 | 24.2 | 24.2 | 24.2 | 24.3 | 24.4 | 24.5 | 24.6 | 24.8 |
| 24.9 | 25.1 | 25.2 | 25.4 | 25.6 | 25.6 | 26.2 | 26.9 | 27.4 | 28.1 |
| 29.5 | 30.6 | 31.3 | 31.9 | 32.2 | 32.4 | 32.5 | 32.6 | 32.7 | 32.7 |
| 32.6 | 32.5 | 32.3 | 31.9 | 31.4 | 31.0 | 30.6 | 30.2 | 29.8 | 29.4 |

Sheet 53 of 57

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 5325. | 4861. | 1795. | 968. | 86778. |
| CMS | 151. | 138. | 51. | 25. | 2457. |
| INCHES | | 2.97 | 4.38 | 4.41 | 4.41 |
| MM | | 75.37 | 111.32 | 112.12 | 112.12 |
| AC-FT | | 2410. | 3560. | 3586. | 3586. |
| THOUS CU M | | 2973. | 4392. | 4423. | 4423. |

MAXIMUM STORAGE = 11.

MAXIMUM STAGE IS 32.7

********** ********** ********** ********** **********

Sheet 54 of 57

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

| OPERATION | STATION | AREA | PLAN | RATIO 1 1.00 | RATIO 2 .75 | RATIO 3 .50 | RATIO 4 .25 |
|---|---|---|---|---|---|---|---|
| HYDROGRAPH AT | 1 | 2.89 (7.49) | 1 | 5397. (152.83) | 4048. (114.63) | 2699. (76.42) | 1349. (38.21) |
| HYDROGRAPH AT | 1 | 2.50 (6.47) | 1 | 5222. (147.87) | 3916. (110.90) | 2611. (73.93) | 1305. (36.97) |
| 2 COMBINED | 1 | 5.39 (13.96) | 1 | 10462. (296.25) | 7847. (222.19) | 5231. (148.13) | 2616. (74.06) |
| ROUTED TO | 2 | 5.39 (13.96) | 1 | 10314. (292.05) | 7735. (219.04) | 5157. (146.02) | 2578. (73.01) |
| HYDROGRAPH AT | 2 | 2.33 (6.03) | 1 | 3537. (100.17) | 2653. (75.13) | 1769. (50.08) | 884. (25.04) |
| 2 COMBINED | 2 | 7.72 (19.99) | 1 | 13831. (391.66) | 10373. (293.74) | 6916. (195.83) | 3458. (97.91) |
| ROUTED TO | 3 | 7.72 (19.99) | 1 | 13601. (385.14) | 10201. (288.86) | 6801. (192.57) | 3400. (96.29) |
| HYDROGRAPH AT | 3 | 1.62 (4.20) | 1 | 3286. (93.04) | 2464. (69.78) | 1643. (46.52) | 821. (23.26) |
| 2 COMBINED | 3 | 9.34 (24.19) | 1 | 15014. (425.14) | 11260. (318.85) | 7507. (212.57) | 3753. (106.28) |
| HYDROGRAPH AT | 3 | 1.36 (3.52) | 1 | 3444. (97.53) | 2583. (73.15) | 1722. (48.77) | 861. (24.38) |
| 2 COMBINED | 3 | 10.70 (27.71) | 1 | 15660. (443.45) | 11745. (332.59) | 7830. (221.73) | 3915. (110.86) |
| HYDROGRAPH AT | 3 | 2.77 (7.17) | 1 | 6184. (175.10) | 4638. (131.33) | 3092. (87.55) | 1546. (43.78) |
| 2 COMBINED | 3 | 13.47 (34.89) | 1 | 19358. (548.44) | 14526. (411.33) | 9684. (274.22) | 4842. (137.11) |
| HYDROGRAPH AT | 3 | 1.77 (4.56) | 1 | 4227. (119.70) | 3170. (89.78) | 2114. (59.85) | 1057. (29.93) |
| 2 COMBINED | 3 | 15.24 (39.47) | 1 | 21462. (607.74) | 16097. (455.80) | 10731. (303.87) | 5366. (151.93) |
| ROUTED TO | 4 | 15.24 (39.47) | 1 | 21392. (605.75) | 16035. (454.35) | 10680. (302.41) | 5330. (150.94) |

Sheet 55 of 57

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ROUTED TO | 17 | 15.24 | 1 | 21393. | 16032. | 10678. | 5325. |
| | | ( 39.47) | | ( 605.79)( | 453.98)( | 302.38)( | 150.79)( |

Sheet 56 of 57

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ...............

| | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
|---|---|---|---|
| ELEVATION | 40.00 | 40.00 | 44.00 |
| STORAGE | 107. | 107. | 323. |
| OUTFLOW | 0. | 0. | 1403. |

| RATIO OF PMF | MAXIMUM RESERVOIR W.S.ELEV | MAXIMUM DEPTH OVER DAM | MAXIMUM STORAGE AC-FT | MAXIMUM OUTFLOW CFS | DURATION OVER TOP HOURS | TIME OF MAX OUTFLOW HOURS | TIME OF FAILURE HOURS |
|---|---|---|---|---|---|---|---|
| 1.00 | 58.35 | 14.35 | 1085. | 21392. | 13.00 | 44.50 | 0.00 |
| .75 | 54.75 | 10.75 | 893. | 16035. | 12.50 | 44.50 | 0.00 |
| .50 | 50.91 | 6.91 | 688. | 10680. | 11.50 | 44.50 | 0.00 |
| .25 | 46.63 | 2.68 | 463. | 5330. | 10.00 | 44.50 | 0.00 |

PLAN 1 STATION 17

| RATIO | MAXIMUM FLOW,CFS | MAXIMUM STAGE,FT | TIME HOURS |
|---|---|---|---|
| 1.00 | 21393. | 38.8 | 44.50 |
| .75 | 16032. | 37.4 | 44.50 |
| .50 | 10678. | 35.5 | 44.50 |
| .25 | 5325. | 32.7 | 44.50 |

Sheet 57 of 57

STABILITY ANALYSIS

APPENDIX E

# TAMS

Job No. 1579-08
Project Mamaroneck Reservoir Dam
Subject Stability Analysis: Phase I Inspection


Date 01 May 81
By A.O
Ch'k. by

## LOADING CONDITIONS

| Case | Description |
|---|---|
| I | Normal Loading - Lake level at top of flashboards (EL 42.5) |
| II | Normal Loading - Lake level at top of spillway crest (EL 40) with an additional Ice Loading of 5 Kips/LF. at 0.5 feet below crest |
| III | Unusual Loading - Lake level at ½ PMF (El 50.91) & Tailwater depth of 12.5 feet |
| IV | Extreme Loading - Lake Level at Full PMF (El 58.35) & Tailwater depth of 15 feet |

## STABILITY AND OVERTURNING CRITERIA

| Case | Location of Resultant | Friction Factor of Safety |
|---|---|---|
| I | middle third | 3.0 |
| II | middle third | 3.0 |
| III | middle third | 3.0 |
| IV | middle third | 3.0 |

# TAMS

Job No. 1579-08
Project Mamaroneck Reservoir Dam
Subject Stability Analysis: Phase I Inspection

Sheet 2 of 18
Date 01 May 81
By A.D.
Ch'k. by

## Assumptions and Notes

(1) For all loading cases: $\gamma_{concrete} = 150\ \#/ft^3$
$\phi(\text{base}) = 45^\circ$ {rock fdn.}
$C(\text{base}) = 1\ ksf$

(2) The assumed configuration is as shown in Figure 1 (page 3)

(3) For Cases III and IV — half the weight of water above the spillway crest at the upstream side was assumed to be an additional dead water weight load.

(4) Flashboards would not withstand ½PMF and Full PMF loadings

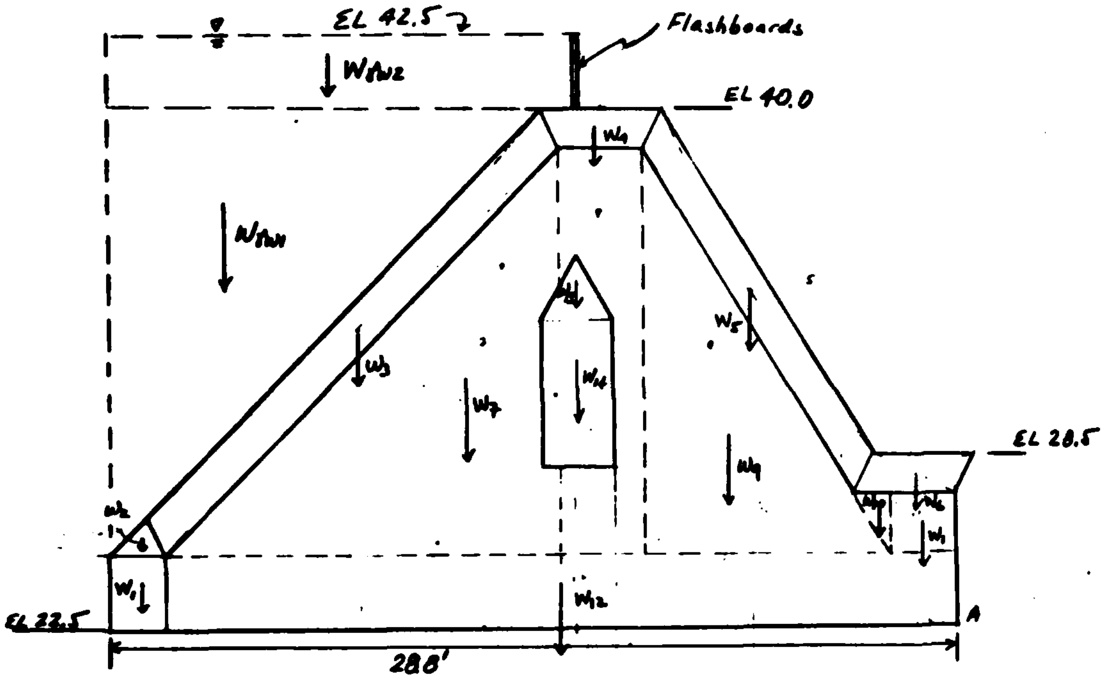
(5) The stability of a typical buttress was examined. The loads on each buttress were computed for a 15 ft length, i.e., the spacing between buttresses.

Also, since there is a gap between the downstream slab (at its bottom) and the underlying foundation, tailwater would enter thereby putting pressure on the inner concrete surfaces

(6) The weight of the haunches was excluded from this analysis.

(7) The Shear Friction Factor of Safety computed for all Cases analyzed did not include passive pressures. For Cases I & II this was of no consequence since the S.F.F.S. values (computed) were greater than 5.00. For Cases III and IV, the water surface above the dam was approx. 13 & 19 feet, respectively. Under these large discharges, the condition of the rock would be unknown, therefore passive pressures were not used in the analysis.

(8) Stability Analyses & Criteria in accordance with recommended guidelines of Corps of Engineers.




ASSUMED TYPICAL SECTION

SCALE 1/4 inch = 1 foot

Figure 1

— WEIGHT COMPUTATIONS —

| | | K/LF | K |
|---|---|---|---|
| $W_1$ | = 0.150 × 1.9 × 2.5 | = 0.71 K/LF × 15' | = 10.7 K ↓ |
| $W_2$ | = 0.150 × 0.5 × 1.9 × 1.3 | = 0.18 K/LF × 15' | = 2.8 K ↓ |
| $W_3$ | = 0.150 × 1.4 × 19.2 | = 4.03 K/LF × 15' | = 60.5 K ↓ |
| $W_4$ | = 0.150 × 1.3 × 3.5 | = 0.68 K/LF × 15' | = 10.2 K ↓ |
| $W_5$ | = 0.150 × 1.3 × 13.5 | = 2.63 K/LF × 15' | = 39.5 K ↓ |
| $W_6$ | = 0.150 × 1.3 × 3.5 | = 0.68 K/LF × 15' | = 10.2 K ↓ |
| $W_7$ | = 0.150 × 0.5 × 13.5 × 13.7 | = 13.9 K/LF ↓ | |
| $W_8$ | = 0.150 × 13.7 × 2.9 | = 5.96 K/LF ↓ | |
| $W_9$ | = 0.150 × 0.5 × 8.4 × 13.6 | = 8.57 K/LF ↓ | |
| $W_{10}$ | = 0.150 × 0.5 × 1.3 × 2.0 | = 0.20 K/LF ↓ | |
| $W_{11}$ | = 0.150 × 2.0 × 2.2 | = 0.66 K/LF ↓ | |
| $W_{12}$ | = 0.150 × 26.9 × 2.5 | = 10.09 K/LF ↓ | |
| $-W_{13}$ | = 0.150 × 0.5 × 2.5 × 2.2 | = 0.41 K/LF ↓ | |
| $-W_{14}$ | = 0.150 × 4.9 × 2.5 | = 1.84 K/LF ↓ | |

| Project | | Job No. | By | Date | Scale | | Dwg. |
|---|---|---|---|---|---|---|---|
| N.Y. State Dam Inspection Program | TAMS NEW YORK ENGINEERS and ARCHITECTS | | | | | Mamaroneck Dam | Page 3/17 |

# TAMS

Job No. 1579-08
Project Mamaroneck Reservoir Dam
Subject Stability Analysis : Phase I Inspection

Sheet 4 of 18
Date 01 May 81
By A.D
Ch'k. by J.P

CENTER OF GRAVITY COMPUTATIONS FOR CONCRETE BUTTRESS

SUMMARY OF WEIGHTS AND

MOMENT ARMS FOR BUTTRESS

SECTION AND COMPUTATION OF MOMENTS

| Designation | Weight (Kips) | Moment Arm From Pt. A (ft) | Moment (K-ft) |
|---|---|---|---|
| $W_7$ | 13.9 ↓ | $13.5 + \frac{1}{3}(13.5) = 18.0$ | 250.2 |
| $W_8$ | 5.96 ↓ | $10.6 + \frac{1}{2}(2.9) = 12.05$ | 71.8 |
| $W_9$ | 8.57 ↓ | $2.2 + \frac{2}{3}(8.4) = 7.80$ | 66.8 |
| $W_{10}$ | 0.20 ↓ | $2.2 + \frac{2}{3}(1.3) = 3.07$ | 0.6 |
| $W_{11}$ | 0.66 ↓ | $\frac{1}{2}(2.2) = 1.1$ | 0.7 |
| $W_{12}$ | 10.09 | $\frac{1}{2}(26.9) = 13.45$ | 135.7 |
| $-W_{13}$ | − 0.41 ↓ | $11.6 + \frac{1}{2}(2.5) = 12.9$ | − 5.3 |
| $-W_{14}$ | − 1.84 ↓ | 12.9 | − 23.7 |
| TOTAL | 37.13 ↓ | | 496.8 |

$$\overline{X}_{C.OF.G.} = \frac{496.8}{37.13\downarrow} \quad \frac{K\text{-}ft}{ft}$$

$$\overline{X}_{C.OF.G.} = 13.38 \text{ feet}$$

$\overline{Y}_{C.O.F}$ not required for this analysis

TAMS

Job No. 1579-08 | Sheet 5 of 18
Project Mamaroneck Reservoir Dam | Date 01 May 81
Subject Stability Analysis : PHase I Inspection | By A.D.
Ch'k. by

## SUMMARY OF WEIGHTS AND MOMENT ARMS FOR CONCRETE DECKS AND COMPUTATION OF MOMENTS

| Designation | Weight (Kips) | Moment Arm From Pt. A (ft) | Moment (K-ft) |
|---|---|---|---|
| $W_1$ | 10.7 ↓ | $26.9 + \frac{1.9}{2} = 27.85'$ | 298.0 ↺ |
| $W_2$ | 2.8 ↓ | $26.9 + \frac{1.9}{2} = 27.85'$ | 78.0 ↺ |
| $W_3$ | 60.5 ↓ | 20.3* | 1,228.2 ↺ |
| $W_4$ | 10.2 ↓ | 12.05 (same as $W_8$) | 122.9 ↺ |
| $W_5$ | 39.5 ↓ | 6.9* | 272.6 ↺ |
| $W_6$ | 10.2 ↓ | 1.4* | 14.3 ↺ |
| TOTAL | 133.9 | | 2014 ↺ |

$W_1$–$W_4$: $84.2^K$; moments $W_1$–$W_4$: $1727^K$

$$\sum W_i \downarrow = 133.9 + 37.13 = 171^K \downarrow \qquad \sum \overset{\curvearrowleft}{W_1} = 2014 + 496.8 = 2510.8 \; K\text{-}ft$$

* The moment arm was computed from drawing diagonols, the arm being the distance from pt. A to their intersection.

## DEAD WATER WEIGHT COMPUTATIONS

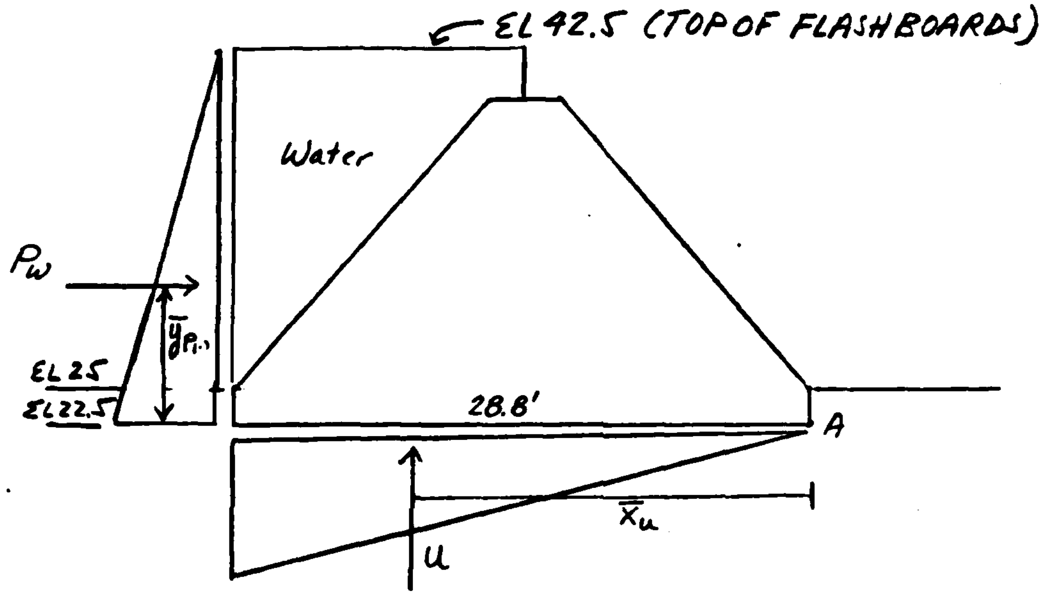
$$W_{\gamma_{W1}} \downarrow = 0.5 \times 14.8 \times 15 \times 0.0624 = 6.93\ ^K/LF \times 15' = 104.0^K \downarrow$$

$$W_{\gamma_{W2}} \downarrow = 15.8 \times 2.5 \times 0.0624 = 2.46\ ^K/LF \times 15' = 36.9^K \downarrow$$

$$\overset{\curvearrowleft}{M}_{\gamma_{W1}} \text{(about A)} = 104.0 \times \{14 + 9.87\} = 2482.5\ K\text{-}ft \circlearrowleft$$

$$\overset{\curvearrowleft}{M}_{\gamma_{W2}} \text{(about A)} = 36.9 \times \left\{13 + \frac{15.8}{2}\right\} = 771.2\ K\text{-}ft \circlearrowleft$$

CASE I - NORMAL POOL WITH FLASHBOARDS




$$\vec{P_w} = \frac{1}{2}\times 0.0624 \times (42.5-22.5)^2 = 12.5^{K}/LF \times 15' = 187.5^{K}\rightarrow$$

$$\overset{\frown}{P_w} = 187.5^{K} \times \frac{1}{3}(42.5-22.5) = 1250 \text{ k-ft}$$

$$u\uparrow = \frac{1}{2}\times 0.0624 \times (42.5-25) \times 28.8 = 15.7^{K} \times 2.0'$$
$$= 31.4\,K\uparrow$$

(note: base width of footing is 2.0 ft)

$$\overset{\frown}{u} = 31.4\left\{\frac{2}{3}(28.8)\right\} = 602.9 \text{ K-ft}$$

$$\Sigma F_H = \vec{P_w} = 187.5^{K}\rightarrow$$

$$\Sigma F_V = \sum_1^{11} W_i\downarrow + W_{fw1}\downarrow + W_{fw2}\downarrow - u\uparrow = 280.5^{K}\downarrow \quad \text{ok}$$

$$\Sigma M_{resisting} = \sum_1^{11} \overset{\frown}{W_i} + \overset{\frown}{M_{fw1}} + \overset{\frown}{M_{fw2}} = 5764.5 \text{ k-ft}$$

# TAMS

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Project Mamaroneck Reservoir Dam | Date 01 May 81

Subject Stability Analysis: Phase I Inspection | By A.O

Ch'k. by

$$\Sigma M_{opposing} = \overrightarrow{P_w} + \overrightarrow{U_w} = 1853 \text{ kip-ft}$$

Location of Resultant

$$\bar{X}_{resultant} = \frac{(M_r - M_o)}{\Sigma F_v} - \frac{B}{3} = \frac{5764.5 - 1853}{280.5} - \frac{28.8}{3}$$

$$\bar{X}_{res} = +4.43 \text{ (inside middle third)}$$

Shear Friction Factor of Safety $(\tan\phi = 1)$

$$S.F.F.S. = \frac{\Sigma F_v \tan\phi + c(L)B}{\Sigma F_H}$$

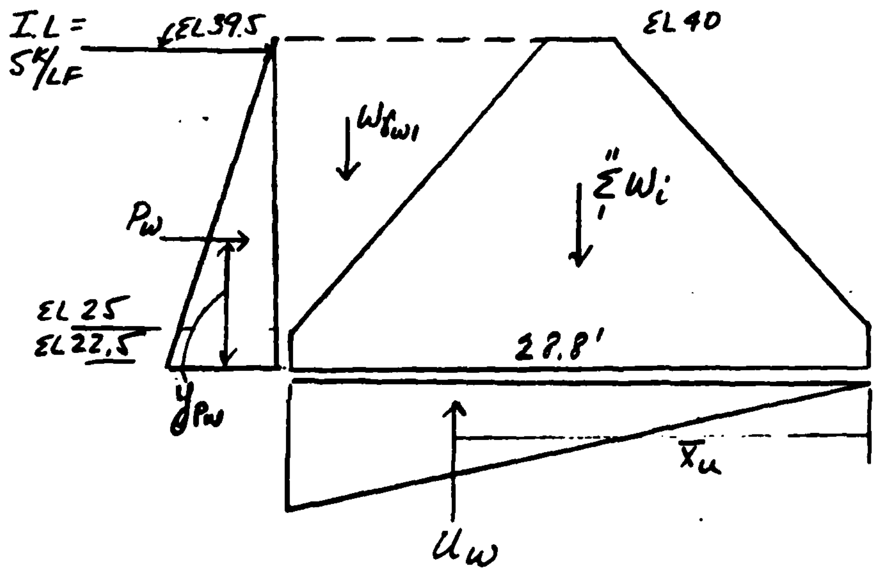
where $L = 28.8$ ft. & $B = 15$ ft.

$$= \frac{280.5 \tan 45 + 1(28.8)(15)}{187.5}$$

$$= 3.8 > 3.0 \text{ (okay)}$$

(See note 7 on pg 2/18 for explanation of passive pressures not used in analysis)

CASE II : NORMAL POOL WITH ICE LOAD




105.3

$\vec{P_w} = \frac{1}{2} \times 0.0624 \times (40 - 22.5)^2 = 9.55\ ^K/_{LF} \times 15' = 143.3\ ^K \rightarrow$

$\overset{\frown}{P_w} = 143.3 \times \left\{\frac{1}{3}(40 - 22.5)\right\} = 836\ K\text{-}ft \circlearrowright$

$U\uparrow = \frac{1}{2} \times 0.0624 \times (40 - 25) \times 28.8 = 13.48\ ^K/_{LF} \times 2' = 27\ ^K\uparrow$

$\overset{\frown}{U_w} = 27 \times \frac{2}{3}(28.8) = 518.4\ K\text{-}ft \circlearrowright$

$\vec{I.L.} = 5\ ^K/_{LF} \times 15' = 75\ ^K \rightarrow$

$\overset{\frown}{I.L.} = 75\ ^K \times (39.5 - 25) = 1087.5 \circlearrowright$

$\Sigma F_H : \vec{P_w} + \vec{I.L.} = 218.3\ ^K \rightarrow$

$\Sigma F_V : \sum_1^{''} W_i\downarrow + W_{\gamma w1}\downarrow - U\uparrow = 248\ ^K\uparrow$

$\Sigma \overset{\frown}{M_r} : \sum_1^{''} \overset{\frown}{W_i} + \overset{\frown}{M_{\gamma w1}} = 4993.3\ K\text{-}ft \circlearrowleft$

$\Sigma \overset{\frown}{M_o} : \overset{\frown}{P_w} + \overset{\frown}{U_w} + \overset{\frown}{I.L} = 2441.9\ K\text{-}ft \circlearrowright$

# TAMS

Job No. 1579-08
Project Mamaroneck River Dam
Subject Stability Analysis : Phase I Inspection


Date 01 May 91
By AD
Ch'k. by

Location of Resultant

$$\bar{X}_{resul} = \frac{\Sigma M_r - M_o}{\Sigma F_V} - \frac{B}{3} = \frac{4993 - 2442}{248} - \frac{28.8}{3}$$

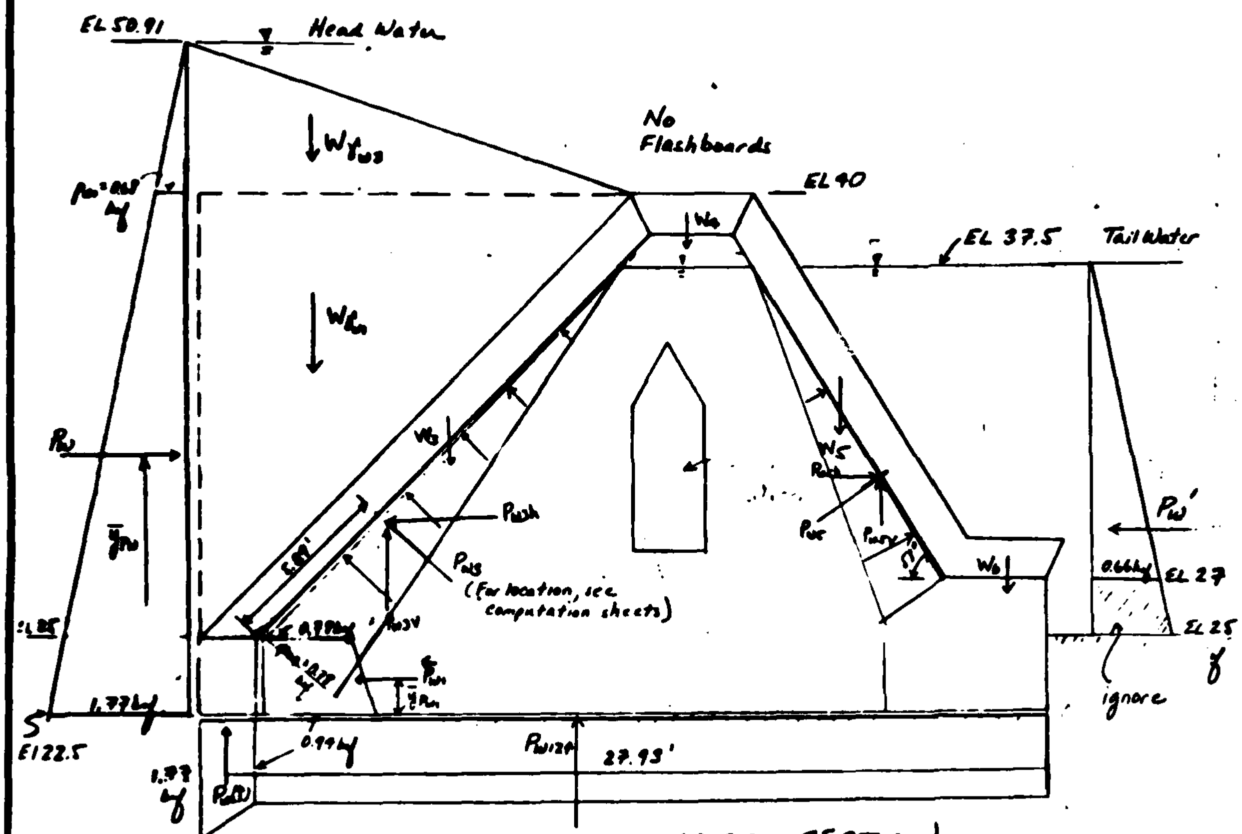
$$X_{result} = 0.69 \text{ feet (inside middle third)}$$

Shear Friction Factor of Safety $(\tan\phi = 1)$

$$SFFS = \frac{\Sigma F_v \tan\phi + cL(B)}{\Sigma F_H} = \frac{248 + 1(28.8)(15)}{218.3}$$

$$S.FFS = 3.11 > 3.0 \quad \text{(Okay)}$$

(See pg 2/18 for explanation of passive pressures not used in analysis)




ASSUMED TYPICAL SECTION

SCALE 1/4" = 1 ft
0 2 4 6 8 10 feet

CASE III : UNUSUAL LOADING (½ PMF)

Compute Upstream Water Force

$p_{w1} = \gamma_w(50.91 - 40) = 0.68$ ksf

$p_{w2} = \gamma_w(50.91 - 22.5) = 1.77$ ksf

$\vec{P}_w = 1.15$ ksf $\times (40' - 22.5) \times 15' = 30.4^k \rightarrow$ ✓

Compute Downstream Water Force

$p_w' = \gamma_w(37.5 - 27) = 0.66$ ksf

$\overleftarrow{P_w'} = \frac{1}{2} \times 0.66 \times (37.5 - 27) \times 0.6 \times 15' = 31.2^k \leftarrow$

Compute Water Force Along Inner Slab of $W_3$

$p_{w3} = \gamma_w(37.5 - 25) = 0.78$ ksf

$P_{w3} = \frac{1}{2} \times 0.78 \times \frac{(37.5 - 25)}{\sin 45} \times 14' = 96.5^k$

Since Upstream Slope = 45°

$\overleftarrow{P_{w3h}} = P_{w3v}\uparrow = 0.707 \times 96.5 = 68.2^k \leftarrow$ And $\uparrow$

Compute Water Force Along Side of $W_1$

$\overleftarrow{P_{w1}} = \left\{\frac{0.78 + 0.94}{2}\right\} \times 2.5 \times 14' = 30.1^k \leftarrow$

Compute Water Force At Base of $W_1$

$P_{w1}\uparrow = \frac{1.77 + 0.94}{2} \times 1.9' \times 15' = 38.6^k \uparrow$ ✓

Compute Water Force Along Inner Surface of $W_5$

$p_{w5} = \gamma_w(37.5 - 27) = 0.66$ ksf

$P_{w5} = \frac{1}{2} \times 0.66 \times \frac{37.5 - 27}{\sin 58°} \times 14' = 57.2^k$

$P_{w5h} = 57.2^k \cos 58 = 30.3^k$ $P_{w5v} = 48.5^k$

| NY State Dam Inspection Program | TAMS NEW YORK ENGINEERS and ARCHITECTS | Job No. | By | Date | Scale | Mamaroneck Dam | Page 10/17 Dwg. |
|---|---|---|---|---|---|---|---|
| Project | | | | | | | |

# TAMS

Job No. 1579-08
Project Mamaroneck Reservoir Dam
Subject Stability Analysis : Phase I Inspection

Sheet 11 of 18
Date 02 May 81
By A D
Ch'k. by

Compute Moment Arm For Each Water Force (About Pt. A)

$\vec{P_w}$ : $$\bar{y}_{Pw} = \frac{0.68\frac{(17.5)^2}{2} + \frac{1}{2}(1.77-0.68)\frac{(17.5)^2}{3}}{0.68(17.5) + \frac{1}{2}(1.77-0.68)(17.5)}$$

$\bar{y}_{pw} \doteq 7.45'$ feet

$\overleftarrow{P_w'}$ : $\bar{y}_{pw} = 2 + \frac{1}{3}(37.5 - 27) = 5.5$ feet

$\overleftarrow{P_{w3}}$ : $r = \frac{37.5 - 25}{\sin 45} = 17.68$

x along u/s ($45°\measuredangle$) $= \frac{17.68}{3} = 5.89'$

Graphically $\bar{x}_{Pw3v} = 22.6'$

$\bar{y}_{Pw3h} = 6.7'$

$\overleftarrow{P_{w1}}$ : $$\bar{y}_{P_{w1}} = \frac{0.78\frac{(2.5)^2}{2} + 0.5\frac{(2.5)^2}{3}(0.94-0.78)}{0.78(2.5) + 0.5(2.5)(0.94 - 0.78)}$$

$\bar{y}_{P_{w1}} = 1.21$ feet

$P_{w1}\uparrow$ : $$\bar{x} = 26.9 + \frac{0.94\frac{(1.9)^2}{2} + \frac{1}{2}(1.9)(1.62-.94)\frac{2}{3}(1.9)}{0.94(1.9) + \frac{1}{2}(1.9)(1.62-0.94)}$$

$\bar{x} = 26.9 + 1.03$

$\bar{x}_{Rup} = 27.93$ feet.

# TAMS

Job No. 1579-08 Sheet 12 of 18

Project Mamaroneck Reservoir Dam Date 04 May 81

Subject Stability Analysis: Phase I Inspection By AD.

Ch'k. by

Compute:

$P_{WS} \nearrow$ : $r = \dfrac{37.5-27}{\sin 58°} = 12.38$ feet

x along d/s (58°) $= \dfrac{12.38}{3} = 4.13$ feet

$\bar{x}_{PWSv} = 5.7$ feet

$y_{PWSh} = 7.9$ feet

Compute Additional Dead Water Weight

$W_{fws} = 0.5(50.91-40) \times 14.8 \times 0.0624 \times 15' = 75.6^{K}\downarrow$

$M_{wfws} = 75.6 \times \{14 + 9.87\} = 1804.6$

Compute Uplift at base of Buttress ftg (Consider only 1' width)

$P_{W12}\uparrow = \{28.8-1.9\} \times 0.0624 \times \{37.5-22.5\} \times 1' = 25.2^{K}\uparrow$

$\bar{x}_{B12\uparrow} = \dfrac{\{28.8-1.9\}}{2} = 13.45'$

| | | | | | | |
|---|---|---|---|---|---|---|
| $\overset{\frown}{P_W}$ : | 301.9 | × | 7.45 | = | 2249.2 ↓ | K-ft |
| $\overset{\leftarrow}{P_W'}$ : | 31.2 | × | 4.17 | = | 130.1 ↑ | K-ft |
| $\overset{\leftarrow}{P_{Sh}}$ : | 68.2 | × | 6.7 | = | 456.9 ↑ | K-ft |
| $\overset{\frown}{P_{SV}}$ : | 68.2 | × | 22.6 | = | 1541.3 ↓ | K-ft |
| $\overset{\leftarrow}{P_{W1}}$ | 30.1 | × | 1.21 | = | 36.4 ↑ | K-ft |
| $\overset{\frown}{P_{W1}}$ | 36.5 | × | 27.93 | = | 1019.4 ↓ | K-ft |
| $\overset{\frown}{P_{WSh}}$ | 30.3 | × | 7.9 | = | 239.4 ↓ | K-ft |
| $\overset{\frown}{P_{WSV}}$ | 48.5 | × | 5.7 | = | 276.5 ↓ | K-ft |
| $\overset{\leftarrow}{M_{wfws}}$ | (From above) | | | | 1804.6 ↑ | K-ft |
| $\overset{\frown}{P_{W12\uparrow}}$ | 25.2 | × | 13.45 | = | 338.9 ↓ | K-ft |

$\overset{\leftarrow}{\Sigma M_r}(P + W_{fws}) = 2428$ K-ft ↑

$\Sigma M_o(P) = 5665$ K-ft

# TAMS

Job No. 1579-08 | Sheet 13 of 18
Project Mamaroneck Reservoir Dam | Date 04 May 81
Subject Stability Analysis: Phase I | By A.D
Ch'k. by

Total Forces and Moments

$\Sigma F_H$ : $\overrightarrow{P_W} - \overleftarrow{P_{W1}} - \overleftarrow{P_{W3h}} - \overleftarrow{P_W'} + \overrightarrow{P_{W5h}} = 202.7\ K \rightarrow$

$\Sigma F_V$ : $\overset{n}{\Sigma} W_i \downarrow + W_{\gamma_{W1}} \downarrow - P_{W3V}\uparrow - P_{W5V}\uparrow - P_{W1}\uparrow + W_{\gamma_{W3}} - P_{W12}\uparrow = 172.2^K$

$\overleftarrow{\Sigma M_r}$ : $\Sigma \overleftarrow{W_i} + \Sigma \overleftarrow{M_r}(P + M_{W\gamma_3}) + \overleftarrow{M}W_{\gamma_{W1}} = 7421.3$ K-ft

$\Sigma \overrightarrow{M_0}$ : $\Sigma \overrightarrow{M_0}(P) = 5665$ K-ft

Location of Resultant :

$$x_{result} = \frac{7421.3 - 5665}{172.2} - \frac{28.8}{3}$$

$x_{result} = 0.60$ feet (inside middle third)

Friction Factor of Safety ($\tan\phi = 1$)

$$F.F.S. = \frac{\Sigma F_V \tan\phi}{\Sigma F_H} = \frac{172.2}{202.7}$$

$F.S. = 0.85 < 1.25$ (No Good)

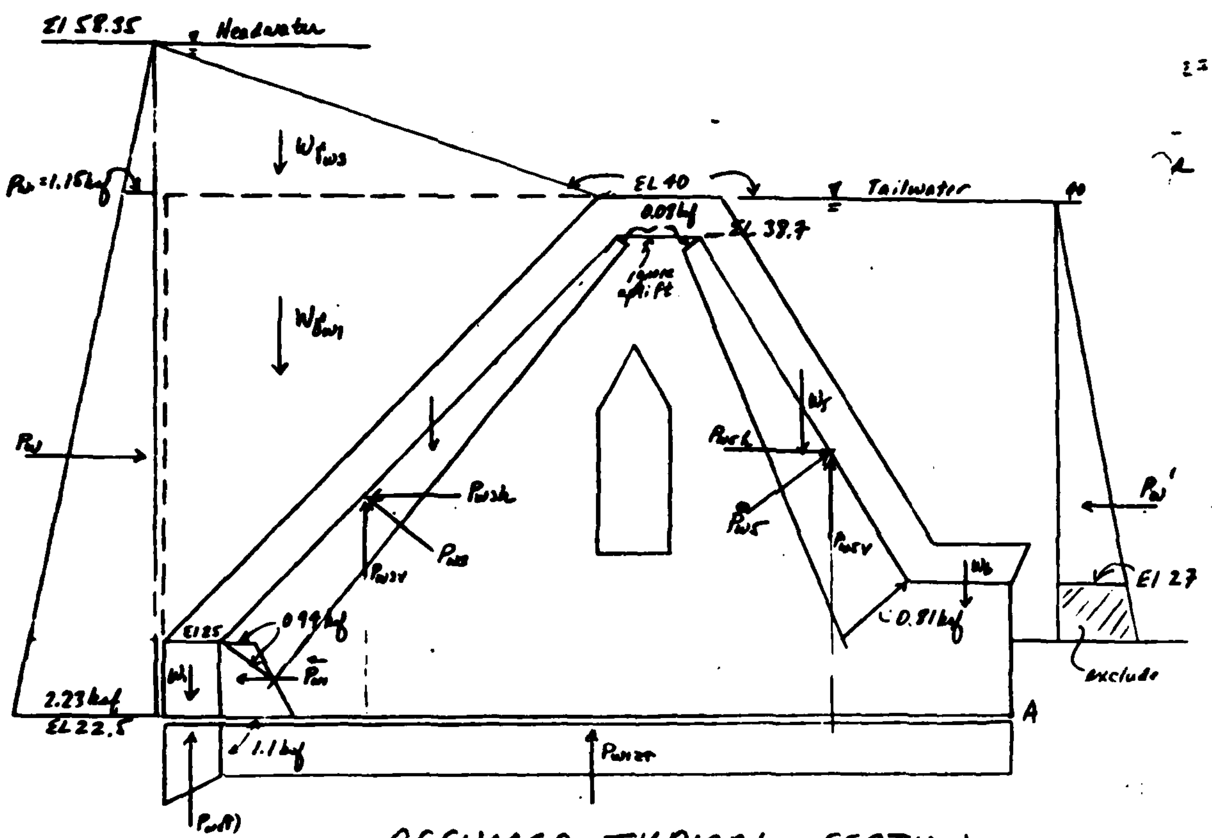
Since this value is low for Ambursen type dams, lets assume that the uplift forces $P_{W1}\uparrow$, $P_{W3}$, $P_{W5}\uparrow$, $P_{W1}$, $P_{W12}\uparrow$, are also 60% of the tailwater depth. Therefore, we multiply $(0.6H)^2$ or 0.36 to the previous computed values, i.e.

$\Sigma F_H$ : $\overrightarrow{P_W} - \overleftarrow{P_{W1}} - 0.36(\overleftarrow{P_{W3h}} - \overrightarrow{P_{W5h}} + \overleftarrow{P_{W1}}) = 246.2$

$\Sigma F_V$ : $\Sigma W_i \downarrow + W_{\gamma_{W1}} \downarrow + W_{\gamma_{W3}} - 0.36(P_{W3V}\uparrow + P_{W5V}\uparrow + P_{W1}\uparrow + P_{W12}\uparrow) = 286.4$

$\therefore S.F.F.S. = \frac{\Sigma F_V \tan\phi + cLB}{\Sigma F_H} = \frac{286.4 + 1(28.8)(15)}{246.2} = 2.9 < 3.0$, (No Good)

See pg 2/8 for explanation of passive pressures not used in analysis




ASSUMED TYPICAL SECTION

Scale 1/4" = 1ft

0 2 4 6 8 10 feet

CASE IV: (PMF)

Compute $P_w$ - Force

$$\vec{P_w} = \left\{\frac{1.15 + 2.23}{2}\right\}(17.5) \times 15' = 443.^{k}/_{LF}$$

$$\bar{X}_{pw} = \frac{1.15\frac{(17.5)^2}{2} + \frac{1}{2}(2.23-1.15)\frac{(17.5)^2}{3}}{1.15(17.5) + \frac{1}{2}(2.23-1.15)(17.5)}$$

$\bar{X}_{pw} = 5.92 ft$ $\qquad \overset{\frown}{P_w} = 2622.6$ K-ft

Compute $P_w'$ - Force

$\overleftarrow{P_w'} = \frac{1}{2}(13)^2\, 0.0624 \times 15' \times 0.6 = 47.5^{k}$

$\bar{X}_{p'w} = 2 + \frac{1}{3}(13) = 6.33'$

$\overset{\frown}{P_w'} = \cancel{205.7 K-ft} = 300.7$ K-ft

Compute $P_{ws}$

$$P_{ws} = \left\{\frac{0.08 + 0.94}{2}\right\} \times \overbrace{\left(\frac{38-25}{\sin 45}\right)}^{19.4} \times 14' = 150.6^{k}$$

$\overleftarrow{P_{wsh}} = P_{wsv} = 150.6 \times 0.707 = 106.5^{k}$

Where $P_{ws}$ acts (from base of force at EL 25)

$$r = \frac{0.08 \times \frac{(19.4)^2}{2} + .5(.94-.08)\frac{(19.4)^2}{3}}{0.08(19.4) + 0.5(.94-0.08)19.4}$$

$r = 6.97$

Graphically

$\bar{x}_{Pwsv} = 20.9$ feet

$\bar{y}_{Pwsh} = 7.4$ feet

| N.Y. State Dam Inspection Program | TAMS NEW YORK ENGINEERS and ARCHITECTS | Job No. | By | Date | Scale | Mamaroneck Dam | Page 14/18 |
|---|---|---|---|---|---|---|---|
| Project | | | | | | | Dwg. |

# TAMS

Job No. 1579-08
Project Mamaroneck Reservoir Dam
Subject Stability Analysis

Sheet 16 of 18
Date 4 May 81
By A.O.
Ch'k. by

Compute $\overleftarrow{P}_{w1}$

$$\overleftarrow{P}_{w1} = \left(\frac{1.1+0.94}{2}\right) \times 2.5 \times 14 = \overset{35.7}{\cancel{3.57}}\,K \leftarrow$$

$$\bar{x}_{\overleftarrow{P}w1} = \frac{0.94\left(\frac{2.5}{2}\right)^2 + \overset{0.166}{\frac{1}{2}(1.1-0.94)}\left(\frac{2.5}{3}\right)^2}{0.94(2.5) + \frac{1}{2}(1.1-0.94)(2.5)}$$

$$\bar{x}_{\overleftarrow{P}w1} = 1.26 \text{ feet} \Rightarrow \overleftarrow{P}_{w1} = \underset{45}{\cancel{45}}\ K\text{-ft}$$

Compute $P_{w1}(\uparrow)$

$$P_{w1}(\uparrow) = \left\{\frac{2.23+1.1}{2}\right\} \times 1.9' \times 15' = 47.45^K \uparrow$$

$$\bar{x}_{pw1} = 26.9 + \frac{1.1\frac{(1.9)^2}{2} + \overset{0.65}{\frac{1}{2}(2.23-1.1)}\frac{(1.9)^2}{3}}{1.1(1.9) + \frac{1}{2}(2.23-1.1)(1.9)}$$

$$\bar{x}_{pw1} = \overset{27.74}{\cancel{\phantom{00}}} \text{ feet} \Rightarrow \overrightarrow{P}_{w1(\uparrow)} = 39.9\ K\text{-ft}$$

Compute $P_{w12}$ (Uplift at base of buttress ftg for 1' width only)

$$P_{w12} = 1.1 \times 1' \times \{28.8-1.9\} = 29.6^K \uparrow$$

$$\bar{x}_{w12} = \frac{28.8-1.9}{2} = 13.45 \text{ ft}$$

# TAMS

Job No. 1579-08
Project Mamaroneck Reservoir Dam
Subject Stability Analysis : Phase I

Sheet 17 of 18
Date 04 May 81
By AD
Ch'k. by

## Computation of Moments (about A)

### For Water Forces

| | K | | ft | | |
|---|---|---|---|---|---|
| $\overrightarrow{P_w}$ : | 443 | × | 5.92 | = | 2662.6 k-ft ↓ |
| $\overleftarrow{P_w'}$ | 47.5 | × | 6.33 | = | 300.7 k-ft ↑ |
| $\overrightarrow{P_{w3v}}$ | 106.5 | × | 20.9 | = | 2225.9 k-ft ↓ |
| $\overleftarrow{P_{w3h}}$ | 106.5 | × | 7.4 | = | 788.1 k-ft ↑ |
| $\overrightarrow{P_{w5v}}$ | 72.9 | × | 6.1 | | 444.7 k-ft ↓ |
| $\overrightarrow{P_{w5h}}$ | 45.6 | × | 8.8 | = | 401.3 k-ft ↓ |
| $\overleftarrow{P_{w1}}$ | 35.7 | × | 1.26 | = | 45. k-ft ↑ |
| $\overrightarrow{P_{w1}}$ | 47.45 | × | 27.74 | = | 1316.3 k-ft ↓ |
| $\overleftarrow{W_{\gamma w3}}$ | 127.1 | × | 23.87 | = | 3034. k-ft ↑ |
| $\overrightarrow{P_{w12}}$ | 29.6 | × | 3.45 | = | 398.1 k-ft ↓ |

$\overleftarrow{\Sigma M_o (P_w)} = 4168$ k-ft ↑

$\overrightarrow{\Sigma M_o (P_f)} = 7449$ ↓ k-ft

# TAMS

Job No. 1579-08
Project Mamaroneck Dam
Subject Stability Analyses


Date 04 May 81
By A. D.
Ch'k. by

Total Forces and Moments

$$\Sigma F_H : \overrightarrow{P_W} - \overleftarrow{P_{W1}} - \overleftarrow{P_{W5h}} - \overline{P'_W} + \overrightarrow{P_{W5h}} = 298.9^K \rightarrow$$

$$\Sigma F_V = \sum_1^{11} W_i \downarrow + W_{\gamma W1} \downarrow + W_{\gamma W3} \downarrow - P_{W3V} \uparrow - P_{W5V} \uparrow - P_{W1} \uparrow - P_{W12} \uparrow = 145.6^K \uparrow$$

$$\Sigma M_r : \Sigma \overleftarrow{W_i} + \Sigma \overleftarrow{M(P + M_{W\gamma})} + \overleftarrow{M_{W\gamma W1}} = 9161. \text{ k-ft}$$

$$\Sigma M_0 : \Sigma \overrightarrow{M_0 (P)} = 7449 \text{ k-ft}$$

Location of Resultant

$$x_{result} = \frac{\Sigma M_r - \Sigma M_0}{F_V} - \frac{B}{4} = \frac{9161 - 7449}{145.6} - \frac{28.8}{3}$$

$$x_{result} = 2.16 \text{ ft (inside middle third)}$$

Friction Factor of Safety ($\tan\phi = 1$)

$$F.F.S. = \frac{F_V}{F_H} = \frac{145.6}{298.9} = 0.49 \quad < 1.1 \text{ (No Good)}$$

For the following analysis, see note on bottom of pg 13.

For PMF Case

$$\Sigma F_H : \overrightarrow{P_W} - \overleftarrow{P_W'} - 0.36(\overleftarrow{P_{W3h}} + \overleftarrow{P_{W1}} - \overrightarrow{P_{W5h}}) = 360.7^K \rightarrow$$

$$\Sigma F_V : \sum_1^{11} W_i \downarrow + W_{\gamma W1} \downarrow + W_{\gamma W3} \downarrow - 0.36(P_{W3V\uparrow} + P_{W5V\uparrow} + P_{W1\uparrow} + P_{W12\uparrow}) = 255.7^K$$

$$\therefore SF.F.S. = \frac{255.7 + 1(28.8)(15)}{360.7} = 1.90 \quad < 3.0 \text{ (No Good)}$$

(See pg 2/18 for explanation of passive pressures not used in analysis)

REFERENCES

APPENDIX F

## REFERENCES


1. "Flood Hydrograph Package (HEC-1) Users Manual for Dam Safety Investigations", U.S. Army Corps of Engineers, Hydrologic Engineering Center, September 1979.

2. "Seasonal Variation of the Probable Maximum Precipitation, East of th 105th Meridian for Areas from 10 to 1,000 Square Miles, and Durations of 6, 12, 24 and 48 Hours", Hydro-meteorological Report No. 33. Weather Bureau, U.S. Department of Commerce, April 1956.

3. "Lower Hudson River Basin Hydrologic Flood Routing Model", Water Resources Engineers, Inc. for the Department of the Army, COE, New York District, January 1977.

4. "Recommended Guidelines for Safety Inspection of Dams", Department of the Army, Office of the Chief of Engineers, Appendix D.

5. "Water Resources Data for New York", Vol. I, U.S. Geological Survey Water-Data Report NY-79-1, 1979.

6. "New England Upland Section", Internal Report, Civil Engineering Department, Purdue University, West Lafayette, Indiana, August 1977.

7. Geologic Map of New York, The University of the State of New York, The State Education Department, Map and Chart Series No. 5, Albany, New York, 1962.

OTHER DATA

APPENDIX G

# DEC DAM INSPECTION REPORT

| RB | CTY | YR. AP. | DAM NO. 233 | INS. DATE | USE | TYPE |
|---|---|---|---|---|---|---|
| 22 | 60 | 30 | 40866 | 041872 | 32 | 4 |

**AS BUILT INSPECTION**

- 1 Location of Spillway and outlet
- 1 Elevations
- 1 Size of Spillway and outlet
- 1 Geometry of Non-overflow section

**1 GENERAL CONDITION OF NON-OVERFLOW SECTION**

- 1 Settlement
- 2 Cracks
- 1 Deflections
- 1 Joints
- 2 Surface of Concrete
- 1 Leakage
- 1 Undermining
- 1 Settlement of Embankment
- 1 Crest of Dam
- 1 Downstream Slope
- 1 Upstream Slope
- 1 Toe of Slope

**1 GENERAL CONDITION OF SPILLWAY AND OUTLET WORKS**

- 2 Auxiliary Spillway
- 2 Service or Concrete Spillway
- 1 Stilling Basin
- 2 Joints
- 2 Surface of Concrete
- 2 Spillway Toe
- 2 Mechanical Equipment
- 1 Plunge Pool
- 2 Drain

- 1 Maintenance
- B Hazard Class
- 3 Evaluation
- 14 Inspector

**COMMENTS:**

Re-const proposed in '78

Supplement D-1

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK 12233

FOR DEPARTMENT USE ONLY
APPLICATION NO. 3uc-99-CC71
DAM NO. 233-866 SPK48
WATERSHED Long Island

# APPLICATION FOR PERMIT

FOR THE CONSTRUCTION, RECONSTRUCTION OR REPAIR OF A DAM OR OTHER IMPOUNDMENT STRUCTURE

Read instructions on reverse side of last sheet before completing this application. PLEASE TYPE OR PRINT CLEARLY IN INK

## PROJECT DESCRIPTION

1. LOCATION ON U.S. GEOLOGICAL SURVEY MAP — Name of Map: Mamaroneck — Latitude: 41° 58' 05" — Longitude: 73° 44' 20"

2. PROPOSED USE FOR IMPOUNDED WATER: Existing dam-utilize for flood control

3. STATE THE HEIGHT ABOVE SPILLCREST OF THE LOWEST PART OF THE IMMEDIATE UPSTREAM ADJOINING PROPERTY OR PROPERTIES: N/A Feet

4. IS THIS PROPOSED POND OR LAKE PART OF A PUBLIC WATER SUPPLY? ☐ Yes ☒ No
If not, where is nearest downstream public water supply intake?

5. SIZE OF AREA DRAINING INTO POND OR LAKE (Acres or Square Miles): 24.3 sq. miles

HEIGHT OF DAM ABOVE STREAM BED? 15 Feet

6. THE DRAINAGE AREA IS COMPOSED OF: (Total = 100%)
___ % Forest ___ % Cropland ___ % Pasture ___ % Other ___ % Swamp 100 % Suburban Lands ___ % Urban Lands

7. TYPE OF SPILLWAY
☐ Service Spillway – Auxiliary Spillway Combination
☐ Pipe Riser ONLY
☒ Other single spillway with new openings through dam
☐ Single Spillway

8. DESIGNER'S ESTIMATE OF CLASS OF HAZARD (As described in "Guidelines for Small Earth Dam Designs")
☐ Class "A" ☐ Class "B" see report Class "C"
NOTE: Provide descriptive information on character of downstream area.

9. SPILLWAY INFLOW DESIGN FLOOD N/A
Frequency ___ Flood Peak ___ cfs Runoff Volume ___ in.

9b. SERVICE SPILLWAY INFLOW DESIGN FLOOD N/A
Frequency ___ Flood Peak ___ cfs Runoff Volume ___ in.

10. THE SINGLE SPILLWAY OR AUXILIARY SPILLWAY IS COMPOSED OF:
☐ Vegetated Earth ☒ Concrete ☐ Timber ☐ Rock-filled Crib ☐ Masonry ☐ Other ___

11. MAXIMUM VELOCITY WITHIN THE SINGLE OR AUXILIARY SPILLWAY: N/A fps

12. SINGLE OR AUXILIARY SPILLWAY DISCHARGE AT DESIGN HIGH WATER: N/A cfs

13. TYPE OF ENERGY DISSIPATER PROVIDED ON SINGLE SPILLWAY
☐ Hydraulic Jump Basin ☐ Drop Structure ☒ Other see plans

14. POND OR LAKE WILL BE DRAINED BY MEANS OF: conduits in dam

WATER WILL BE SUPPLIED TO RIPARIAN OWNERS DOWNSTREAM BY MEANS OF: N/A

15. AREA-CAPACITY DATA — Answer 1, 2 and 3, OR 1, 2, 4, 5

| | ELEVATION, Referred to Assumed Benchmark | SURFACE AREA | VOLUME STORED |
|---|---|---|---|
| 1. Top of Dam | 43 Feet | 40 Acres | 241 Acre-Feet |
| 2. Design High Water | N/A Feet | Acres | Acre-Feet |
| 3. Single Spillway Crest | N/A Feet | Acres | Acre-Feet |
| 4. Auxiliary Spillway Crest | Feet | Acres | Acre-Feet |
| 5. Service Spillway Crest | Feet | Acres | Acre-Feet |

16. TYPE OF ENERGY DISSIPATER AT OUTLET OF CONDUIT:
☐ Impact Basin ☐ Hydraulic Jump Basin ☒ Plunge Pool ☐ Other ___

IS PIPE RISER PROVIDED WITH AN ANTI-VORTEX DEVICE? ☐ Yes ☐ No N/A

17. DRAWDOWN TIMES: Answer 1 and 2, OR 1, 3 and 4

| | Yes | No |
|---|---|---|
| 1. Has provision been made to evacuate 90% of the storage below the lowest spillway crest within fourteen days? | ☒ | ☐ |
| 2. Can the single spillway evacuate 75% of the storage between the maximum design high water and the spillway crest within 48 hours? | ☒ | ☐ |
| 3. Can the Service Spillway evacuate 75% of the storage between the auxiliary spillway and the Service Spillway crest within seven days? | ☐ | ☐ |
| 4. Can the Service Spillway and the Auxiliary Spillway in combination evacuate the storage between the design high water and the auxiliary spillway crest within 12 hours? | ☐ | ☐ |

18. SOIL DATA — State the character of the bed and banks in respect to natural types of soil materials, hardness, perviousness, water bearing, effect of exposure to air and water, uniformity, etc.
N/A

If an earth dam, describe the material to be used in the embankment.

What is the source of embankment fill material(s)?

Are there porous seams or fissures beneath the foundation of the proposed dam? ☐ Yes ☐ No N/A

Method used to obtain the above soil data N/A
☐ Soil Borings ☐ Test Pits

19. DESIGN ENGINEER
Name of Agency or Individual: Hazen and Sawyer
P.E. License No. of Individual:
Address: 60 Lexington Avenue, NYC 10017
Title:
Telephone No.: 212-986-0033

20. CONSTRUCTION ENGINEER
Name of Agency or Individual: West. Co. Dept of Public Works
P.E. License No. of Individual:
Address: County Office Building, White Plains, NY 10601
Title:
Telephone No.: 914-682-2537

19-2 (2/77)

ALBANY, NEW YORK 12233

# APPLICATION FOR PERMIT

APPLICATION NO.

☒ **Article 15 (STREAM PROTECTION) Environmental Conservation Law**

- ☒ For the construction, reconstruction or repair of a DAM or other impoundment structure.
- ☐ For the construction, reconstruction or repair of any permanent DOCK, pier or wharf; and any dock, pier or wharf, built on open work supports, which has a top surface area of more than 200 square feet.
- ☐ For the disturbance of a STREAM BED or excavation in or fill of navigable waters.

☐ **Article 24 (FRESHWATER WETLANDS) Environmental Conservation Law**

☐ **Article 25 (TIDAL WETLANDS) Environmental Conservation Law**

Read instructions on reverse side of last sheet before completing this application. PLEASE TYPE OR PRINT CLEARLY IN INK.

1. NAME AND ADDRESS OF APPLICANT (First, M.I., Last): Westchester County Department of Public Works
   TELEPHONE NO.: 914-682-2537
   Street Address: Westchester County Office Building
   Post Office: White Plains — State: New York — Zip Code: 10601

2. NAME AND ADDRESS OF OWNER (If different from Applicant) (First, M.I., Last): Westchester Joint Water Works
   Street Address: 1625 Mamaroneck Avenue
   Post Office: Mamaronekk — State: New York — Zip Code: 10543

3. AGENCY SUBMITTING APPLICATION: Westchester County Department of Public Works

## PROJECT DATA

4. LOCATION OF WETLAND OR ADJACENT AREA, STREAM, OR BODY OF WATER
   Body of Water: Mamaroneck River — Town: Village of Mamaroneck, Town of Harrison — County: Westchester
   Locate by giving distance and direction from a commonly accepted and identifiable landmark or body of water or U.S.G.S. coordinates.

5. SIZE OF WORK SECTION: see plans/eng. report

6. SPECIFIC LOCATION: Westchester Joint Water Works Dam (WJWW)

7. WILL PROJECT UTILIZE STATE OWNED LANDS? ☐ Yes ☒ No

8. TYPE AND EXTENT OF WORK (Feet of new channel; yards of material to be removed, draining, dredging, filling, etc.)
   Construction of conduits in existing WJWW Dam for flood control purposes. See reports, plans and specifications for details

9. DOES PROJECT COMPLY WITH
   A. Use Guidelines (If any): N/A
   B. Development Restrictions (If any): N/A

10. PURPOSE (Hardship)
    Flood control with maximum benefit downstream in the Village of Mamaroneck by reducing flood peaks of 1, 2 and 3-year storms

11. IF A DAM OR OBSTRUCTION, INDICATE (existing dam)
    Height: +15 — Size of Pond: 241 acre-feet

12. PROPOSED STARTING DATE: 2/1/78

13. APPROXIMATE COMPLETION DATE: 5/1/78

14. NAME AND ADDRESS OF TWO OFFICIAL NEWSPAPERS IN LOCALITY WHERE PROPOSED ACTIVITY IS LOCATED

| | |
|---|---|
| The Daily Item | The Daily Times |
| 33 New Broad Street | 126 Librarie Avenue |
| Port Chester, NY | Mamaroneck, NY |

15. CERTIFICATION
    I hereby affirm under penalty of perjury that information provided on this form and all attachments submitted herewith is true to the best of my knowledge and belief. False statements made herein are punishable as a Class A misdemeanor pursuant to Section 210.45 of the Penal Law. As a condition to the issuance of a permit, the applicant accepts full legal responsibility for all damage, direct or indirect, of whatever nature, and by whomever suffered, arising out of the project described herein and agrees to indemnify and save harmless the State from suits, actions, damages and costs of every name and description resulting from the said project.

DATE ______________________ SIGNATURE ______________________

95-19-2 (2/77)

— SEE REVERSE SIDE —

# WESTCHESTER JOINT WATER WORKS

*Serving the Village of Mamaroneck, The Towns of Mamaroneck and Harrison*

1625 MAMARONECK AVENUE · 698-3500

MAMARONECK, N. Y. 10543

January 5, 1978

Mr. George Danskin
New York State Department
of Environmental Conservation
21 South Putt Corners Road
New Paltz, New York 12561

Dear Mr. Danskin:

This letter authorizes Frank C. Bohlander, Commissioner of Public Works, Westchester County, to make application on behalf of the Westchester Joint Water Works for permission to construct a conduit in t e existing dam for flood control purposes.

Very truly yours,

John G. Hock

JOHN G. HOCK, P.E.
Manager

JGH:h

CC: Mr. Frank C. Bohlander, Commissioner
Public Works, Westchester County

L. Moore & G. Koch
S. Zeccolo
SP Appl. No. 360-99-0071 (SP-1048) - Westchester Co. Dept. of Public Works

February 1, 1978

Enclosed is a copy of an application under Section 15-0503 of the Environmental Conservation Law for a permit to build a dam.

Would you please review this within the area of your interest and let me have any comments or criticisms you care to make.

Encl.

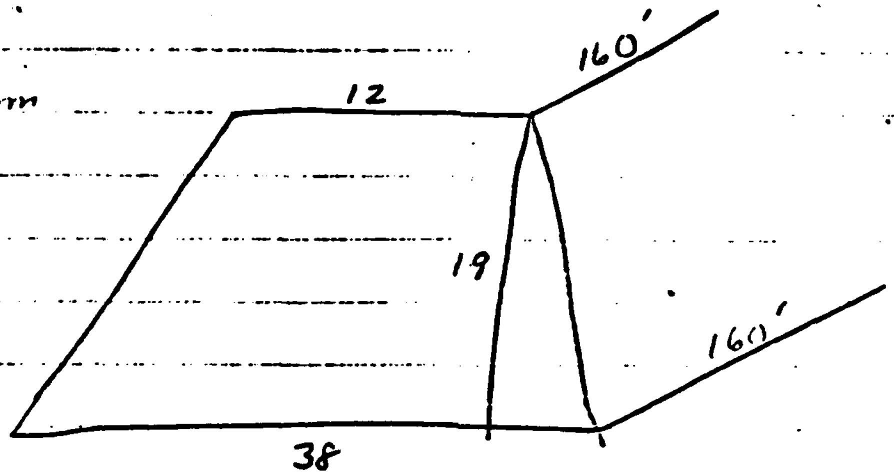
SJZ:scs

S. Zeccolo
G. Koch
Review of proposed modification to Westchester Water Works
Dam Appl. #360-99-0071 Dam 233-866 Long Island
February 27, 1978

I have reviewed the plans and design report for the proposed modifications to the dam. The purpose of this project is to reduce the peak outflows for storms with a return frequency of less than 3 years. Since the proposed modification will increase the spillway capacity, I have no objection to the project.

GK/jb

Volume of Dam




$$V = \frac{(28)(19)(160)}{54} = 1576 \text{ cu yd}$$

Impounding Capacity

$$\begin{array}{r} 6.6 \text{ Mill} \\ \underline{\div 43560} \\ 151 \end{array} \text{ acre ft}$$

1330

3-39-30-000 (11E-8147)

STATE OF NEW YORK

DEPARTMENT OF PUBLIC WORKS

DIVISION OF ENGINEERING

ALBANY

Received Mar. 20, 1930 Dam No. 233-866

Disposition App. Mar. 24, 1930 Watershed Long Id.

Foundation inspected

Structure inspected

# Application for the Construction ~~or Reconstruction~~ of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N. Y., in compliance with the provisions of Section 948 of the Conservation Law (see last page of this application) for the approval of specifications and detailed drawings, marked Westchester Joint Water Works No. 1 Alexander Potter and Robert H. Stevens, Associate Engineers, herewith submitted for the {construction ~~reconstruction~~} of a dam herein described. All provisions of law will be complied with in the erection of the proposed dam. It is intended to complete the work covered by the application about August 1, 1930.
(Date)

1. The dam will be on Mamaroneck River flowing into Long Island Sound in the town of Mamaroneck, County of Westchester and on the site of the present dam 500 ft. above Winfield Ave., Mamaroneck, N.Y.
(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)

2. Location of dam is shown on the Oyster Bay quadrangle of the U.S.G.S. United States Geological Survey.

3. The name of the owner is Westchester Joint Water Works No. 1

4. The address of the owner is 284 Mamaroneck Ave., Mamaroneck, N. Y.

5. The dam will be used for water supply storage

6. Will any part of the dam be built upon or its pond flood any State lands? No.

7. The watershed above the proposed dam is 14.46 square miles.

8. The proposed dam will create a pond area at the spillcrest elevation of 18 acres and will impound 6,600,000 cubic feet of water.

9. The maximum height of the proposed dam above the bed of the stream is 19 feet ........ inches.

10. The lowest part of the natural shore of the pond is 6 feet vertically above the spillcrest, and everywhere else the shore will be at least 4 feet above the spillcrest.

11. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam Winfield Avenue road and bridge would be washed away.

12. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) hard granite.

13. Facing down stream, what is the nature of material composing the right bank?
Rock outcrop covered with clay.

14. Facing down stream, what is the nature of the material composing the left bank?
Rock outcrop covered with clay.

15. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. The bottom of the stream indicates a granite formation, and the shores are formed by rock outcrops. The rock formation does not indicate disintegration by exposure.

16. Are there any porous seams or fissures beneath the foundation of the proposed dam? No drillings were taken but provisions have been made to grout all seams.

17. WASTES. The spillway of the above proposed dam will be 130 feet long in the clear; the waters will be held at the right end by an earth embankment, the top of which will be 4 feet above the spillcrest, and have a top width of 20 feet; and at the left end by a rock ledge the top of which will be 8 feet above the spillcrest, and have a top width of 50 feet.

18. The spillway is designed to safely discharge 2,510 cubic feet per second.

19. Pipes, sluice gates, etc., for flood discharge will be provided through the dam as follows:
The spillway section has been designed to take care of a run-off of 250 c.f.s. per square mile of drainage area.

20. What is the maximum height of flash boards which will be used on this dam? 2 ft.

21. APRON. Below the proposed dam there will be an apron built of concrete feet long across the stream, 130 feet wide and 1 foot thick.

22. Does this dam constitute any part of a public water supply? Yes

## SECTION 948 OF THE CONSERVATION LAW

**§ 948. Structures for impounding water; inspection of docks; penalties.** No structure for impounding water and no dock, pier, wharf or other structure used as a landing place on waters shall be erected or reconstructed by any public authority or by any private person or corporation without notice to the superintendent of public works, nor shall any such structure be erected, reconstructed or maintained without complying with such conditions as the superintendent of public works may by order prescribe for safeguarding life or property against danger therefrom. No order made by the superintendent of public works shall be deemed to authorize any invasion of any property rights, public or private, by any person in carrying out the requirements of such order. The superintendent of public works shall have power, whenever in his judgment public safety shall so require, to make and serve an order directing any person, corporation, officer or board, constructing, maintaining or using any structure hereinbefore referred to, remove, repair or reconstruct the same within such reasonable time and in such manner as shall be specified in such order, and it shall be the duty of every such person, corporation, officer or board, to obey, observe and comply with such order and with the conditions prescribed by the superintendent of public works for safeguarding life or property against danger therefrom, and every person, corporation, officer or board failing, omitting or neglecting so to do, or who hereafter erects or reconstructs any such structure hereinbefore referred to without submitting to the superintendent of public works and obtaining his approval of plans and specifications for such structures when required so to do by his order or who hereafter fails to remove, erect or to reconstruct the same in accordance with the plans and specifications so approved shall forfeit to the people of this state a sum not to exceed five hundred dollars to be fixed by the court for each and every offense; every violation of any such order shall be a separate and distinct offense, and, in case of a continuing violation, every day's continuance thereof shall be and be deemed to be a separate and distinct offense. This section shall not apply to a dam where the area draining into the pond formed thereby does not exceed one square mile, unless the dam is more than ten feet in height above the natural bed of the stream at any point or unless the quantity of water which the dam impounds exceeds one million gallons; nor to a dock, pier, wharf or other structure under the jurisdiction of the department of docks, if any, in a city of over one hundred and seventy-five thousand population. This section as hereby amended shall not impair the effect of an order heretofore made by the conservation commission or commissioner under this section prior to the taking effect of chapter four hundred and nintey-nine of the laws of nineteen hundred and twenty-one, nor require the approval by the superintendent of public works of plans and specifications theretofore approved by such commission or commissioner under this section.

The foregoing information and accompanying plans and specifications are correct to the best of my knowledge and belief.

Westchester Joint Water Works No. 1 Owner.

By Augustus V. Heine, authorized agent of owner.

Address of signer 284 Mamaroneck Av. Mamaroneck, N.Y. Date March 14, 1930

Form IW51. 11-6-14-1000 (16-1036) Acc. 382

(NOTICE: After filling out one of these forms as completely as possible for each dam in your district, return it at once to the Conservation Commission, Albany.)

STATE OF NEW YORK

CONSERVATION COMMISSION

ALBANY

# DAM REPORT

June 8th, 1915
(Date)

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Old Mamaroneck Waterworks Dam Dam.

This dam is situated upon the Mamaroneck River (Give name of stream)

in the Town of Mamaroneck Westchester County,

about one mile (State distance) from the Village ~~town~~ of Mamaroneck

The distance up (Up or down) stream from the dam, to the Mamaroneck Ave Bridge (Give name of nearest important stream or of a bridge)

is about one fourth mile (State distance)

The dam is now owned by New York Interurban Water Co. (Give name and address)

and was built in or about the year 1900, and was extensively repaired or reconstructed during the year 1914.

As it now stands, the spillway portion of this dam is built of 2"x8" plank (State whether of masonry, concrete or timber)

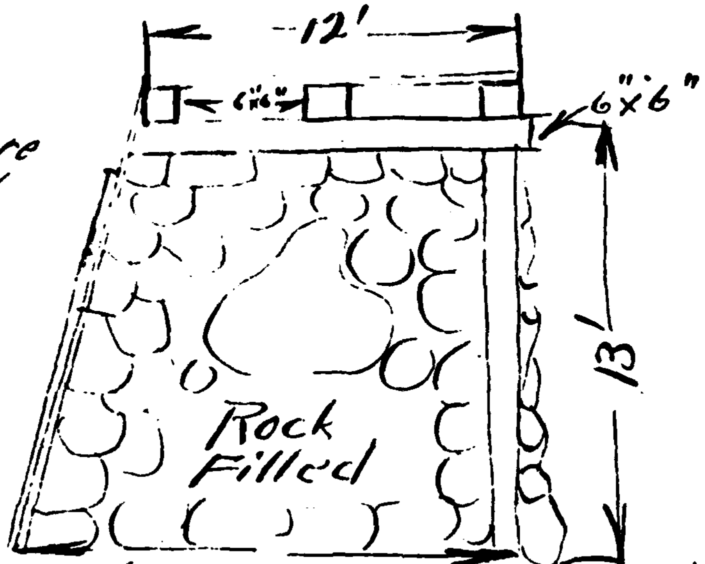
and the other portions are built of Earth and Rocks and Timber (State whether of masonry, concrete, earth or timber with or without rock fill)

As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is Solid Rock and under the remaining portions such foundation bed is Solid Rock

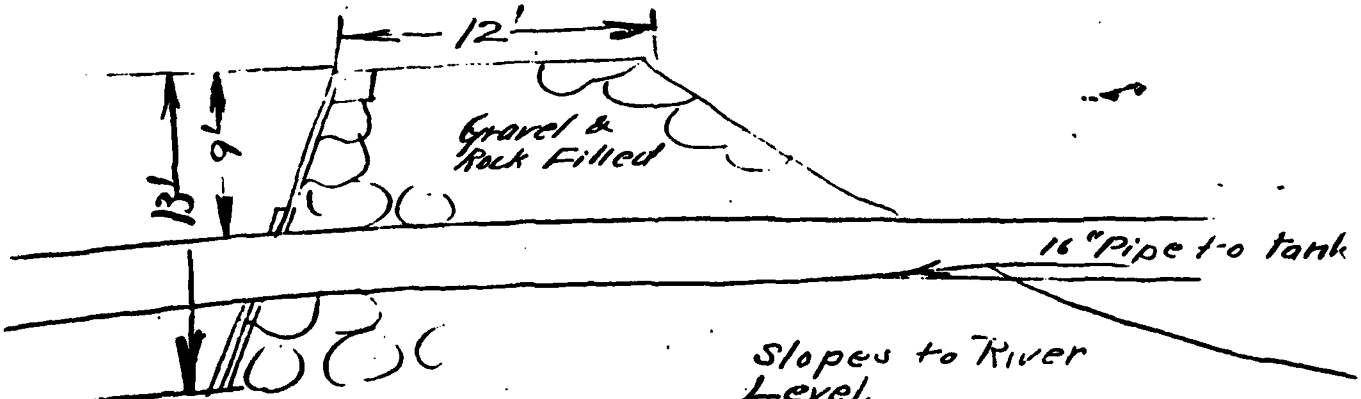
231

(In the space below, make one sketch showin[g] the form and dimensions of a cross section through the sp'llway or waste-weir of this dam, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the greatest height of the dam above the stre[am] bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)

Face Plank are 1½" Thick and Double below water line.

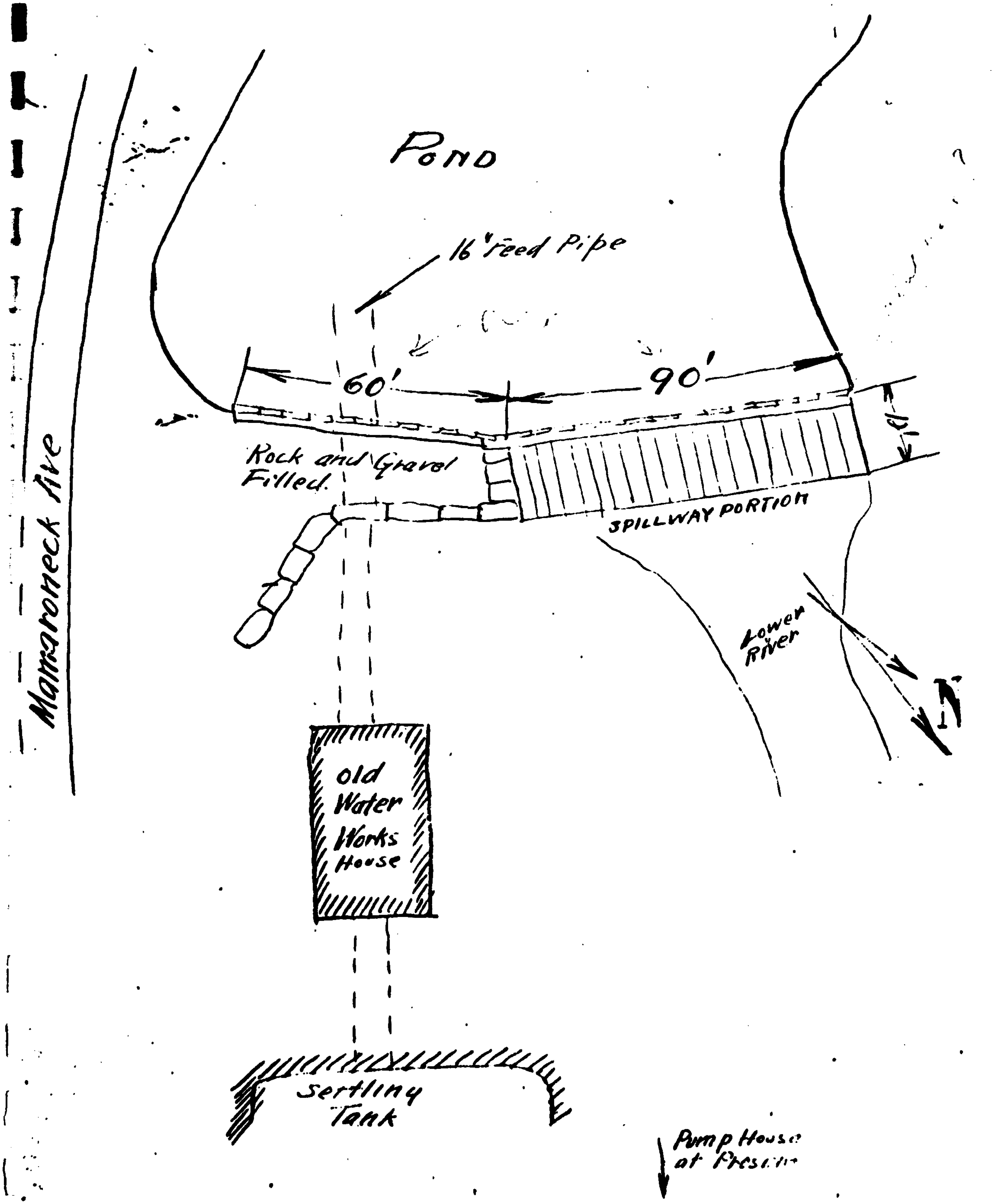



Bottom is width resulting from a slope of 1' in 9" Bad?




All in good Condition as it WAS repaired last year. Sections all ⊥ to River.

(In the space below, make a third sketch showing the general plan of the dam, and its approximate position in relation to buildings or other conspicuous objects in the vicinity.)



The total length of this dam is 160 feet. The spillway or waste-weir portion, is about 90 feet long, and the crest of the spillway is about Three feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: one 16" pipe to settling basin

At the time of this inspection the water level above the dam was 0 ft. 5 in. ~~below~~ above the crest of the spillway.

(State briefly, in the space below, whether, in your judgment, this dam is in good condition, or bad condition, describing particularly any leaks or cracks which you may have observed.)

This dam seems in good condition throughout as it was almost entirely rebuilt last year.

Reported by L. D. Seymour
(Signature)

Wolcott N.Y.
(Address—Street and number, P. O. Box or R. F. D. route)

(Name of place)

Form 1W64. 6-13-30 5000 (10-1304)

(NOTICE: After filling out one of these forms as completely as possible for each dam in your district, return it at once to the Conservation Commission, Albany.)

STATE OF NEW YORK

CONSERVATION COMMISSION

ALBANY

# DAM REPORT

Feb 13th, 1913
(Date)

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Mamaroneck River Dam.

This dam is situated upon the Mamoraneck River (Give name of stream) in the Town of Mamoraneck, Westchester County, about 2 mile (State distance) from the Village ~~or City~~ of Mamoraneck.

The distance up (Up or down) stream from the dam, to the Bridge crossing the river (Give name of nearest important stream or of a bridge) is about 750 feet (State distance).

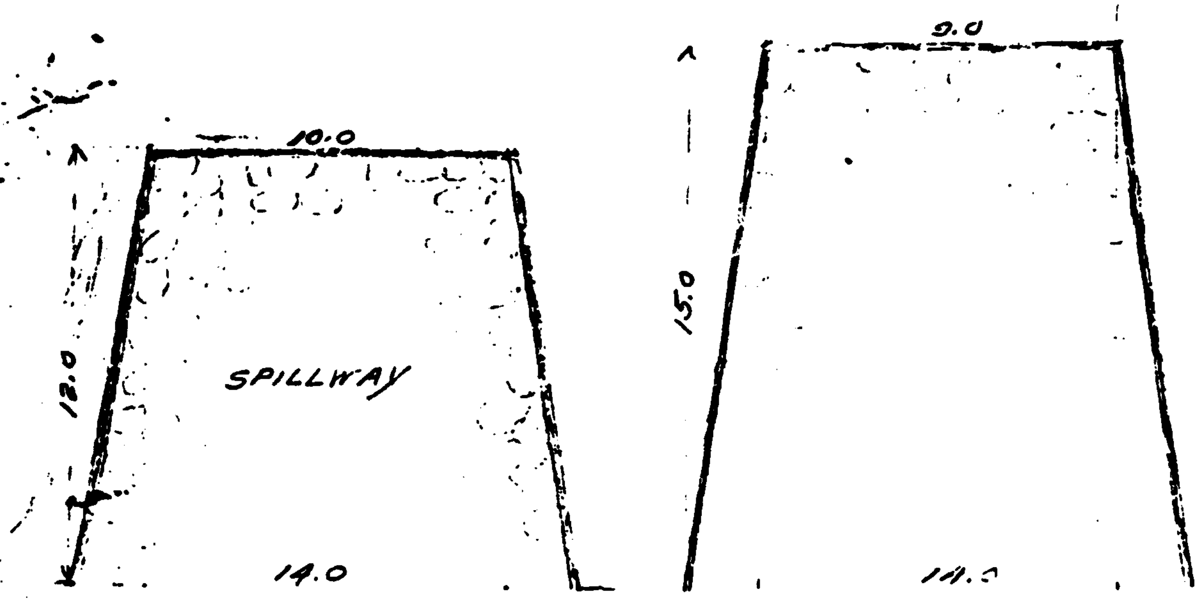
The dam is now owned by Suburban Water Co (Give name in full) and was built ~~in or about the year~~ over 100 years ago, and was extensively repaired or reconstructed during the year 1912.

As it now stands, the spillway portion of this dam is built of Timber (State whether of masonry, concrete or timber) and the other portions are built of Timber facing filled in with Stone (State whether of masonry, concrete or of timber with or without rock fill)

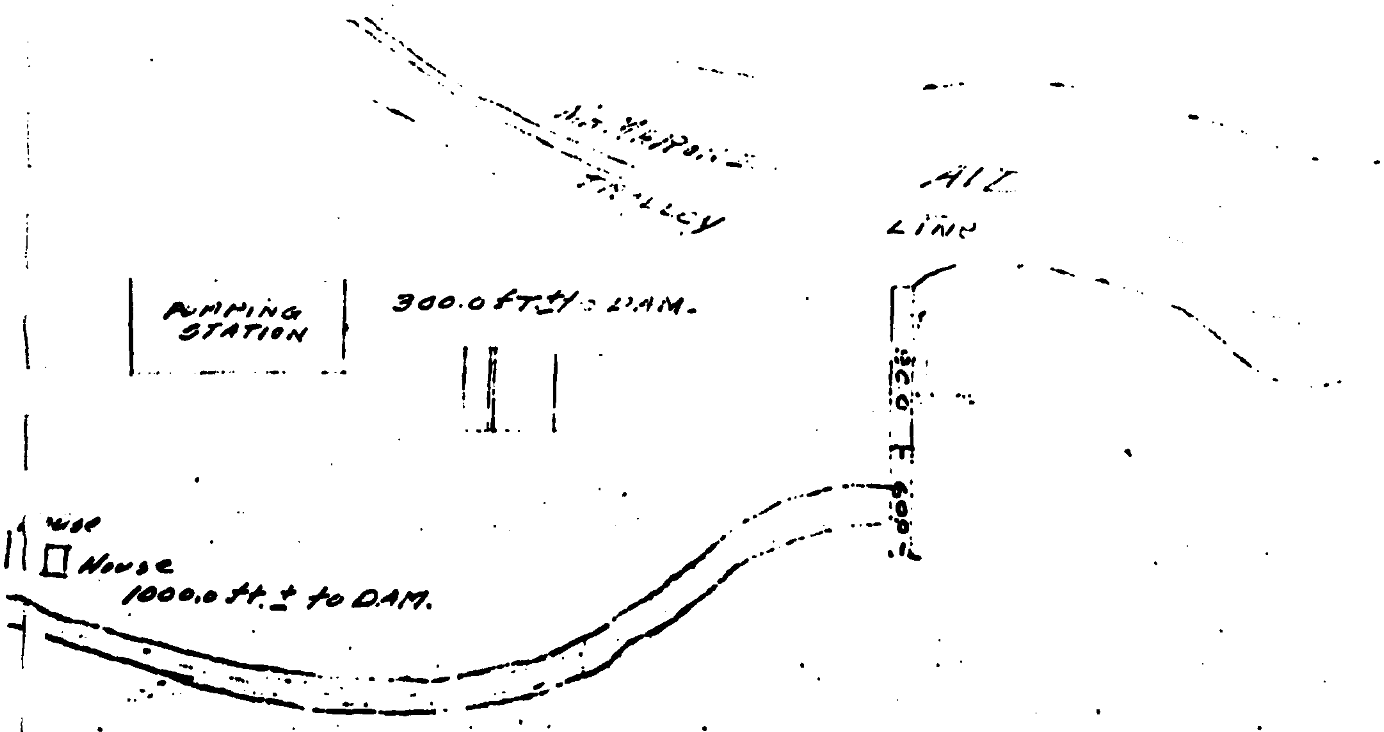
As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is Rock and under the remaining portions such foundation bed is Rock

Sewer Inspector (?)

(In the space below, make one sketch showing the form and dimensions of a cross section through the spillway or waste-weir of this dam, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the greatest height of the dam above the stream bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)




(In the space below, make a third sketch showing the general plan of the dam, and its approximate position in relation to buildings or other conspicuous objects in the vicinity.



The total length of this dam is 150 feet ............ feet. The spillway or waste-weir portion, is about 90 foot ............ feet long, and the crest of the spillway is about 3 ............ feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: 2 10 inch pipes 50 feet from road end of dam ............

State briefly, in the space below, whether, in your judgment, this dam is in good condition, or bad condition, describing particularly any leaks or cracks which you may have observed.)

The dam is in poor condition and has always been so But the size of the spillway does away with any danger of the dam being carried away.

[redacted]

Reported by Benjamin M. Bailey
(Signature)

White Plains R F D Route 1
(Address—street and number, P. O. Box or R. F. D. route)

............
(Name of place)

(SEE OTHER SIDE)

DATE

FILMED